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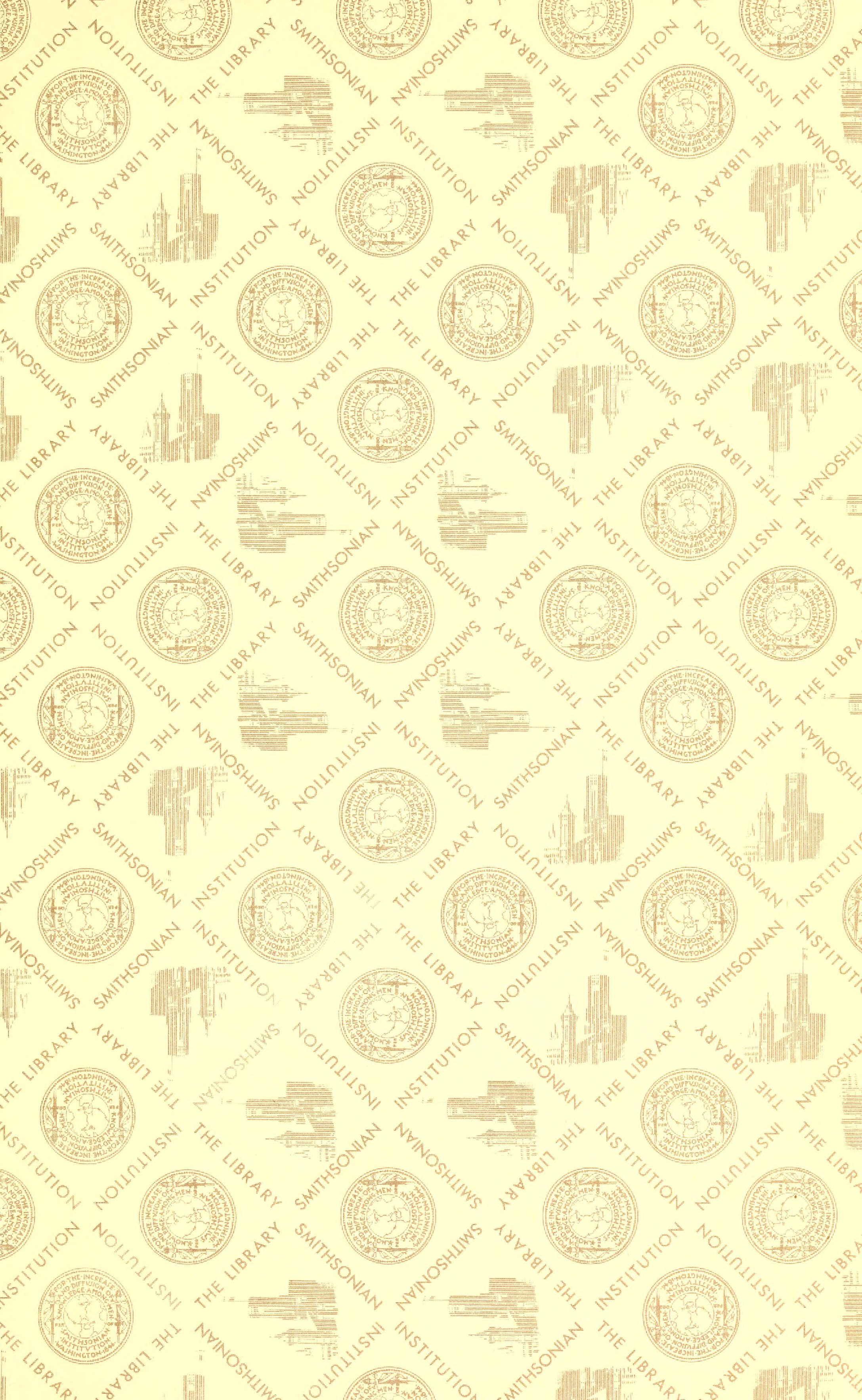

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Explanation of Plate I (Geometridæ).	To face Plate I at page 129 of Vol. XXXI.
Additions and Alterations to Birds of Sikkim Himalayas	To go at the end of the article on page 893 of Vol. XXX, No. 4.

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ERRATA

Volume XXXI, No. 1

Page 112, line 19 for *Burhinius* read *Burhinus.*
,, 188 ,, 51 ,, *leucoephala* read *leucocephala.*
,, 190 ,, 48 ,, *Cyanosyloia* read *Cyanosylvia.*
,, 192 ,, 43 ,, *albifrons* read *atrifrons.*
,, 194 ,, 10 ,, latteral *read* lateral.
,, ,, ,, 22 ,, *bonapartci* read *bonapartei.*
,, 195 ,, 24 ,, Bulfinch *read* Bullfinch.
,, 203 ,, 35 ,, J. P. Mills *read* T. P. M. O'Callaghan.

No. 2

Page 235 line 37 *for* mounted *read* moulted.
,, 250 ,, 4 ,, Shandun *read* Shandur.
,, ,, ,, 21 ,, ,, ,,
,, ,, ,, 32 ,, ,, ,,
,, 251 ,, 19 ,, *nicerillei* read *nicevillei.*
,, 264 ,, 23 ,, *Dicurus* read *Dicrurus.*
,, 269 ,, 22 ,, *phillipinus philippinus* read *phillippinus philippinus.*
,, 270 ,, 34 ,, per *read* par.
,, ,, ,, 48 ,, *Ptynoprogne* read *Ptyonoprogne.*
,, 371 ,, 20 ,, *Rhiphidura* read *Rhipidura.*
,, 434 ,, 7 ,, the Tring types *read* these particular Tring types.
,, 479 ,, 7 ,, *Hieætus* read *Hieræetus.*
,, 484 ,, 47 ,, *indicius* read *indicus.*
,, 491 ,, 3 ,, *Phyrrhrocorax* read *Pyrrhocorax.*
,, 494 ,, 4 ,, *Acreuthornis* read *Arceuthornis.*
,, 522 ,, 14 ,, *Anas* read *Anser.*
,, ,, ,, 15 ,, *brachyrynchus* read *brachyrhynchus.*
,, ,, ,, 21 ,, ,, ,,
,, ,, ,, 28 ,, *onocrocotalus* read *onocrotalus.*
,, ,, ,, 33 ,, *paradoxurus* read. *paradoxus.*
,, ,, ,, 35 ,, ,, ,,
Legend on plate—
Page 524 line 15 ,, Osmatson *read* Osmaston.
,, 526 ,, 44 ,, *Eupoditis* read *Eupodotes.*

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Cooper, H. L.	Naini Tal.
Cooper, H. R. (B.SC., F.C.S.)	Cinnamara.
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Cutch, Kumar Shri Godji (*Life Member*)	Cutch.
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Davies, Capt. V. K. N. (I.A.)	Bombay.
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Director of the Deutsches Entomologisches Institut der Kaiser-Wilhelm-Gesellschaft	Germany.
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Dunlop, Dr. W.	Baghdad.
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Ezra, David	Calcutta.
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Ferrar, M. E.	Metali.
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Gill, H.	Kalain.
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Gladstone-Solomon Capt. W. E. (I.E.S.)	Bombay.
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Jones, Major W. E.	Europe.
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Julius, Sydney	Colombo.
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Khattau, Dharamsey Mulraj	Bombay.
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Kurundwad Senior State, Meherban Bhalchandrarao Chintaman *alias* Anna Saheb Patwardhan	Kurundwad.
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Lane, H. S.	Guntakal.
Latham, H. D.	Vellore.
Latif, Sarhan C.	Calcutta.
La Touche, J. F. D.	Rangoon.
Laud, D. S.	Bombay.
Laurie, M. V. (I.F.S.)	Madura.
Lawson, D. W. (R.N.)	Mandalay.
Lawther, B. C. A.	Peshawar.
Leach, A. H. L.	Rangoon.
Lee, D. H. (*Life Member*)	Europe.
Lee, Major Robert (I.M.S.)	Bombay.
Leitch, Dr. J. Neil (M.B.B.S. (Lond.), M.R.C.I., L.R.C.P.)	Moran.
LeMarchand, A. E. M.	Europe.
LeMarchand, W. M.	Calcutta.
Leonard, Lt.-Col. W. H. (I.M.S.)	Bombay.
Leonard, P. M. R.	Kutkai.
Leslie, M.	Bombay.
Lewis, E. S. (P.C.S.)	Delhi.
Lewis, J. D.	Osaka, Japan.
Ley, Hon'ble Mr. A. H. (C.S.I., C.I.E., I.C.S.)	Delhi.
Ley, W. E. (I.C.S.)	London.

LIBRARIES—

Agricultural Library, The Librarian, U.P.	Nawabgunj.
Allahabad Public Library, The Secretary	Allahabad.
Arthur Library, The Honorary Secretary	Castle Rock.
Benares, Hindu University Library, The Librarian	Benares.

LIBRARIES—*continued.*	
Burma, Bernard Free Library, The Honorary Librarian	Rangoon.
Hyderabad, The Librarian, State Library	Hyderabad Dn.
Lahore, University of Punjab, The Librarian	Lahore.
Librarian, Students Library, St. Xavier's College	Bombay.
Lucknow, Public Library, The Honorary Librarian	Lucknow.
Madras, Connemara Public Library, The Principal Librarian	Madras.
Public Library, Museums and National Gallery of Victoria, The Chief Librarian	Melbourne.
Station Library, The Honorary Secretary	Simla.
United Service Library, The Honorary Secretary	Poona.
Lightfoot, S. St. C.	Taunggyi.
Lightfoot, Capt. G. S. (I.P.)	Assam.
Limbdi, H. H. Maharana Shri Sir Daulatsinhjee (K.C.I.E.)	Limbdi.
Lindley-Hinde, G.	Calcutta.
Lindsay, J. H. (I.C.S.)	Calcutta.
Lindsay-Smith, Col. J. (I.A.)	Murree.
Lister, R. S.	Ghooni, Bengal.
Little, E.	Kirkee, Poona.
Lloyd, Col. C. R. (A.S.C., D.S.O.)	Lahore.
Lloyd, J. B.	London.
Loch, Miss N. F.	Nakuria, E. Africa.
Locket, A.	Numaligarh.
Lodge, G. E.	England.
Logan Home, Major W. M.	Ajmer.
Lomas, H. A. (I.C.S.)	London.
Long, G. R. (I.F.S.) (*Life Member*)	England.
Longbottom, Capt. J. L.	England.
Lorimer, Major D. L. R. (C.I.E., I.A.) (*Life Member*)	London.
Lory, F. B. P. (M.A.)	Poona.
Lowndes, Capt. D. G. (*Life Member*)	England.
Lowndes, R. C.	Bombay.
Lowsley, C. O.	Ahmednagar.
Lowther, E. H. N.	England.
Lucas, Major J. de. B. T. (R.F.A.)	Europe.
Lucknow, Provincial Museum, The Curator	Lucknow.
Ludlow, F. (M.A., M.B.O.U., I.E.S.) (*Life Member*)	England.
Luke, J. H.	Narayanganj.
Luke, K. J.	Barrackpore.
Lunawada, Maharaj Kumar Rangitsingh	Lunawada.
Lunham, Lt.-Col. J. L. (I.M.S.)	Bombay.
Lyall, Lt.-Col. R. A.	S. Africa.
Lynch Blosse, H. R. (I.C.S.)	Lahore.
Lytton, H. E. The Right Hon'ble Victor Alexander George Earl (P.C., G.C.S.I., G.C.I.E.)	Bengal.
MacBey, W. D.	London.
MacColl, H. H. (I.F.S.)	Rangoon.
Macdonald, A. St. J.	Dooriah.

MacDonald, A. B. (R.A.)	Glasgow.
MacDonald, R.	Misa.
Macdonell, J. F.	Bombay.
MacDougall, A.	Bombay.
MacGregor, Capt. R. F. D. (I.M.S.)	Bombay.
MacKenna, Sir James (C.I.E., I.C.S.)	London.
Mackenzie, J. M. D. (I.F.S.) (*Life Member*)	Rangoon.
Mackenzie, Major L. H. L. (I.M.S.)	Gilgit.
Mackenzie, J. M.	Calcutta
Mackenzie, T. J.	Indore.
Mackenzie, Wm.	Madras.
Mackereth, J. (I.F.S.)	Rangoon.
Mackie, A. W. W. (I.C.S.)	Poona.
Mackinlay, Lt.-Col. Chas	Scotland.
Mackwood, F. E.	Colombo.
Mackwood, F. M.	London.
Mac Lachlan, R. B.	Europe.
Mac Lachlan, Capt. D.	Bombay.
Macleod, A. (I.C.S.)	Peshawar.
Macleod, Sir Norman (*Kt.*)	England.
Macleod, R. D. (I.C.S.)	Etawah.
MacMichael, N. (I.C.S.)	Madras.
Macnaghten, Sir Henry (*Kt.*)	London.
Macpherson, J. C.	Amritsar.
Macqueen, H. C.	Dehra Dun.
Madan, F. R.	South Mangalore.
Mahomedbhoy Currimbhoy Ebrahim, Sir, Bart	Bombay.
Main, T. F. (B.SC.)	Poona.
Malcolm, C. A. (I.F.S.)	Nagpur.
Maltby, Major C. M. (I.A., M.C.)	India.
Manavadar, Khan Shree Fatehdinkhan (*Life Member*).	Manavadar.
Mandlik, Narayan V. (*Life Member*)	Bombay.
Mann, Dr. H. H. (D.SC.)	Poona.
Marjoribanks, N. E. (C.I.E., C.S.I., I.C.S.)	Madras.
Marris, H. E. Sir William (K.C.S.I., K.C.I.E., I.C.S.)	United Province.
Marryatt, N.	Ajmer.
Marshall, Arch. McL. (*Life Member*)	England.
Marshall, A. W.	Scotland.
Marshall, Col. F. J. (C.B., C.M.G., D.S.O.)	England.
Marshall, Mrs. H. A.	Travancore.
Marshall, J. McL. (*Life Member*)	Scotland.
Marshall, Brig.-Genl. T. E. (R.A.)	N. Wales.
Martin, Major C. de. C. (I.M.S.)	Rangoon.
Martin, Col. Gerald (*Life Member*)	London.
Martin, S. J.	Almora.
Mason, Miss E. D.	Madras.
Matthews, W. H.	Pashok.
Mawson, Mrs. G. T.	Malad-Thana.
Maxwell, R. M. (I.C.S., C.I.E.)	Kaira.
Maxwell, M. (*Life Member*)	Europe.
Mayes, W.	Europe.

Maynard, H. A. V.	Europe.
McCoard, L. A.	Pyinmana.
McConaghy, Lt.-Col. C. B. (I.M.S.) (*Life Member*)	Nepal.
McGlashan, J. (C.E.)	Calcutta.
McIntosh, Alex. (C.E.)	England.
McIntosh, K. H.	Mussoorie.
McMahon Museum, The Honorary Secretary	Quetta.
Mears, C. E. D.	Indore.
Mehta, Dr. M. V. (F.R.C.P. (Ireland) L.M. (Rotunda) and R.C.P.I., L.M.S.)	Bombay.
Meinertzhagen, Lt.-Col. R.	London.
Menezes, J. Hector	Goa.
Menon, K. G.	Trichoor.
Mercer, David	Scotland.
Merrikin, M. S.	Rangoon.
Merson, Duncan T.	Mango Range.
Metcalfe, Capt. M. R. (I.A.)	Europe.
Millard, A. W. P. (*Life Member*)	Bombay.
Millard, W. S. (F.Z.S.) (*Life Member*)	England.
Miller, A. C. (O.B.E., M.A.)	Poona.
Miller, John I. (F.R.G.S., F.Z.S.)	Calcutta.
Mills, Major J. D. (*Life Member*)	England.
Mills, J. P. (I.C.S.)	Calcutta.
Milner, C. E.	Rangoon.
Milroy, A. J. W.	Gauhati.
Miraj, Shrimant Sir Gungadhar Rao Ganesh *alias* Babasaheb Patwardhan (K.C.I.E.) (*Life Member*)	Miraj.
Miranda, F. X. (F.L.S.)	Savantwadi.
Mirchandani, Tolo K. (B.E., A.M.I.E., P.F.S.)	Dharwar.
Mitchell, Lt. E. D. Treneer	Peshawar.
Mitchell, F. J.	Lahore.
Mitchell, H. H. G. (*Life Member*)	London.
Mitchell, Capt. R. St. J. (R.E.)	Europe.
Modi, Dr. Jivanji Jamshetji (B.A., Ph.D., C.I.E., J.P.)	Bombay.
Montagnon, D. J. (*Life Member*)	Bindukuri.
Monte, Dr. D. A. de (L.M. & S.)	Bandra.
Monteath, G. (I.C.S.) (*Life Member*)	Belgaum.
Monteath, J. (I.C.S.)	Bombay.
Montgomerie, A. (I.C.S.)	Satara.
Montmorency, Sir Geoffrey (K.C.V.O., C.I.E., C.B.E., I.C.S.)	Simla.
Mooney, H. F. (I.F.S.)	Sambalpur.
Moore, J.	London.
Moore, Capt. A. C. (I.A.)	Mawlaik.
Morgan, F. I.	Javali.
Morgan, R. W. D.	Scotland.
Morgan, Major J. S. H.	Madras.
Morison, Major J. (I.M.S.)	Bombay.
Morris, Chas. F.	Bombay.
Morris, Lt.-Col. D. O. (*Life Member*)	London.
Morris, R. C.	Attikan.

Morris, Chas. W. G.	Attikan.
Morton, Geo B.	Calcutta.
Morvi, H.H. The Maharaja Lakhdiriji Waghji (*Life Member*)	Morvi.
Mosse, Lt.-Col. A. H. E. (I.A.) (*Life Member*)	Bombay.
Mudhol, Shrimant Sir Malojirao Raje Ghorpade (K.C.I.E.)	Mudhol.
Muir, G. B. F. (I.C.S.)	Europe.
Muir, Wm. Angus (M.A., M.C., I.F.S.)	Bombay.
Mullan, Prof. J. P. (M.A., F.Z.S., F.L.S.)	Bombay.
Muller, Dr. H. C. (D.SC.)	Bombay.
Mulroney, J. T.	Kurseong.
Mundy, N. S.	Silchar.
Munns, F. A. C.	Barhampur.
Munro, F. H.	Europe.
Murland, Major H. F. (*Life Member*)	Mandalay.
Murphy, P. J.	Paksey.
Murray, Lt.-Col. J. H. (C.I.E., I.M.S.)	Bombay.
Murray, A. E.	Moran.
Musgrave-Hanna, Capt. J. R.	Mandalay.
Mysore, The Director of Agriculture	Bangalore.
Mysore, Government Museum, The Superintendent	Bangalore.
Mysore, H.H. The Maharaja Krishnaraj Woodayar Bahadur (G.C.S.I., G.B.E.) (*Life Member*)	Mysore.
Nagpur, Central Museum, The Curator	Nagpur.
Namjoshi, V. K. (*Life Member*)	Cambay.
Napier-Ford, G. S.	Vandiperiyar.
Naraenji Dwarkadas (*Life Member*)	Bombay.
Narayanlal Bansilal, Raja (*Life Member*)	Bombay.
Narrotum Morarji Goculdas (*Life Member*)	Bombay.
Nash, H. J.	Bombay.
Nawanagar, H.H. The Jam Saheb (G.C.S.I., C.B.E., K.C.S.I.) (*Life Member*)	Jamnagar.
Needham, J. E. (C.B.E.)	England.
Needham, F. M.	Murkong-Sellek.
Nepal, Supradipta Manyaber General Mohun Sumshere Jung Bahadur Rana (K.C.I.E.) (*Life Member*)	Nepal.
Nevill, Capt. G. A. (I.A.)	Balipara.
Nevill, Capt. T. N. C.	London.
Newcome, Lionel	Somwarpett.
Newland, Major B. E. M. (I.M.S.)	Bombay.
Newman, Lt.-Col. H. E. M.	Waziristan.
Nicholetts, W. A. B.	Rangajan.
Nicholson, Lt.-Col. F. L. (D.S.O., M.C.)	England.
Niederer, George	Bombay.
Norman, Col. H. H. (R.A.M.C.)	England.
Norman, John B.	Champaran.
Norris, J. P.	U. S. A.
Nougerede, L. J. de la	Sadiya.
Noyce, F. (I.C.S.) (*Life Member*)	Bombay.
Nurse, Lt.-Col. C. G. (F.E.S.) (*Life Member*)	England.

Oberholser, Harry C. (*Life Member*)	Washington, D. C.
O'Brien, Lt.-Col. Edward	Kolhapur.
O'Brien, H. C.	Johannesburg.
O'Callaghan, T. P. M.	Sadiya.
O'Donel, H. V.	Hasimara.
Ogilvie, G. H. (I.F.S.) (*Life Member*)	Myitkyina.
Oliver, A. W. L.	Hankow, China.
Oliver, Major D. G.	Srinagar.
Oliver, L. C.	Attikan.
Olivier, Col. H. D. (R.E., F.Z.S.) (*Life Member*)	England.
Ollenbach, O. C. (F.E.S.)	Dehra Dun.
O'Neill, Major H. J. D.	London.
Ormiston, W.	Ceylon.
O'Rorke, Major J. M. W.	London.
Osborne, A. F.	Tuticorin.
Osborne, W. H. (I.F.S.)	Rangoon.
Osmaston, A. E. (I.F.S.)	Naini Tal.
Osmaston, B. B. (C.I.E., I.F.S.)	England.
Osmaston, B. H.	Haldwani.
O'Sullivan, A. G. J.	Godhra.
Oswald Little, Major J.	Darjeeling.
Paddison, R. H. (P.W.D.)	England.
Page, A. J. (I.C.S.) (*Life Member*)	Rangoon.
Palanpur, H.H. Sir Nawab Saheb Taley Mahomed, Khan Bahadur (K.C.I.E., K.C.V.O.)	Palanpur.
Palitana, H.H. The Thakor Saheb Bahadur Sinhji (*Life Member*)	Palitana.
Palmes, W. T. (I.C.S.)	London.
Panday, Mrs. J. L.	Bombay.
Parish, N. B.	Europe.
Parker, H. (I.C.S.)	Shwebo.
Parlett, L. M. (I.C.S.) (*Life Member*)	England.
Parry, N. E. (I.C.S.)	Aijal, Assam.
Paterson, E. A.	Calcutta.
Patiala, H.H. The Maharaja Sir Bhupendar Singh (G.C.S.I., G.C.I.E., G.C.B.E.) (*Life Member*)	Patiala.
Patiala, Capt., Rao Raja Birindra Singhji (*Life Member*)	Patiala.
Patterson, A.	London.
Patuck, P. S. (I.C.S.) (*Life Member*)	London.
Pawsey, C. R. (I.C.S.)	Mangaldai.
Peacock, E. H. (B.F.S.) (*Life Member*)	Mawlaik.
Pears, Hon'ble Mr. S. E. (C.S.I., C.I.E., I.C.S.)	Coorg.
Pearson, Capt. R. Forbes (M.C.)	Bolarum.
Peck, N. F. (I.C.S.)	Calcutta.
Peddie, G.	Secunderabad.
Peebles, W. J. M.	London.
Peppe, Capt. F. H. (R.F.A.)	Nowshera.
Percival, A. P. (I.F.S.)	England.
Percival, Hon'ble Mr. P. E. (C.I.E., I.C.S.)	Karachi.
Perfect, E.	London.

Perry, Major S. (R.A.)	London.
Pershouse, Major Stanley	London.
Pestonji Jivanji (N.C.S.) (*Life Member*)	Hyderabad, Dn.
Petit, Dhunjibhoy Bomanji (*Life Member*)	Bombay.
Petit, Jehangir Bomanji (*Life Member*)	Bombay.
Petley, C. A.	Toungoo.
Petrie, Walter M.	Karachi.
Phatak, Major V. M.	Gwalior.
Phayre, Major R. B. (M.C.)	Pachmarhi, C. P.
Philip, C. L. (I.C.S.)	Sambalpur.
Phillips, A. A. (I.S.R.)	Europe.
Phillips, G. C.	Bombay.
Phillips, W. W. A.	Matugama.
Phipson, H. M. (F.Z.S.) (*Life Member*)	London.
Phythian-Adams, Major E. G. (I.A.)	Nilgiris.
Pilditch, D.	Benares.
Pinhey, Capt. L. A. G.	Hyderabad, Dn.
Pipe, T. S.	Dharwar.
Pitman, Major C.R.S.	Africa.
Pogson, Major F. V.	Bombay.
Poncins, Viscount Edmund de (*Life Member*)	France.
Pope J. A. (I.C.S.)	Indore.
Pratap Singh Lal Ram (B.A., LL.B.) (*Life Member*)	Dehra Dun.
Prendargast, H. V.	Cawnpore.
Priestley, E. (D.S.P.)	Dharwar.
Pringle, Sir Norman, Bt.	Prome.
Procter, Sir Henry (*Kt.*, C.B.E.)	London.
Procter, Miss Joan B. (F.Z.S.)	London.
Pudukkottai, State Museum, The Curator	Pudukkottai.
Purkis, F. C. (B.F.S.)	Rangoon.
Purkis, H. Vernon	Bhadarwa.
Quarry, F. G.	Dehra Dun.
Quarry, P. S.	Chinsirah.
Radhanpur, H. H. Shri Jalaluddin Khanji (*Life Member*)	Radhanpur.
Rae, Major M. E. (I.A.) (*Life Member*)	Peshawar.
Ragg, H. A.	Munnar.
Raitt, W. Chas.	Kutta.
Rajadhyaksha, G. S. (I.C.S.)	Satara.
Rajgarh, H.H. Raja Rawat Sir Birendra Singh (K.C.I.E.) (*Life Member*)	Rajgarh.
Rajkot, H.H. Sir Lakhajiraj (K.C.I.E.)	Rajkot.
Ralston, Lt.-Col. W. H. (D.S.O., I.A.)	Razani.
Rane, K. R. (M.M. and S.P.)	Andheri.
Rane, Yeshwantrao K.	Andheri.
Ravenshaw, Col. C. W. (*Life Member*)	London.
Rayner, A. B. (I.S.E.)	Balloki, Punjab.
Readymoney, N. J.	Bombay.
Rees, R.	Calcutta.
REGIMENTAL OFFICERS' MESSES—	
The Royal Engineers	Roorkee.

Regimental Officers' Messes—*continued.*

1st Bn. The Worcestershire Regiment	Meerut
1st Kings Shropshire	Poona.
6th D.C.O. Lancers	Meerut.
Royal Deccan Horse	Dera Ismail Khan.
Queen Victoria's Own Madras Sappers and Miners	Bangalore.
1st Bn. 2nd Bombay Pioneers	Bombay.
1st Bn./4th Bombay Grenadiers	Bombay.
4/4th Bombay Grenadiers	Razani.
1/6th Rajputana Rifles	Razmak.
3/6th Rajputana Rifles	Landi Kotal.
1st Royal Bn. 9th Jat Regt. L.I.	Fyzabad.
3/10th Baluch Regiment	Lahore.
4/10th Baluch Regiment	Quetta.
1/12th F.F. Regt. (P.W.O. Sikhs)	Jhansi.
4/12th F.F. Regt. (Sikhs)	Ambala.
5/12th Q.V.O. Guides, F.F.	Mardan.
1/13th F.F. Rifles (Cokes)	Razmak.
6/13th Royal F.F. Rifles	Delhi.
3/15th Punjab Regiment	Allahabad.
1/16th Punjab Regiment	Jhelum.
3/17th Dogra Regiment	Alipore.
2/1st K.G.O. Gurkha Rifles	Razmak.
2nd K.E.O. Gurkhas	Dehra Dun.
1/10th Gurkha Rifles	Fort Sandeman.
Reid, E. C.	Europe.
Reid, Mrs. D. W. (*Life Member*)	Bombay.
Reuben, D. E. (I.C.S.)	Cuttack.
Rewa, H.H. The Maharaja Gulabsingh Bahadur (*Life Member and Vice Patron*)	Rewa.
Reynolds, L. W. (C.I.E., I.C.S.)	Jodhpur.
Ribeiro, J. (L.C.E.) (*Life Member*)	Santa Cruz.
Richards, B. D. (B.SC.)	England.
Richardson, F. D. S.	England.
Richmond, G. N.	Bhamo, Burma.
Richmond, R. D. (I.F.S.)	Ootacamund.
Ridland, J. G.	Bombay.
Rishworth, Dr. H. R. (I.M.S.)	Bhusawal.
Ritchie, Sir Adam (*Kt.*)	Rangoon.
Ritchie, Lt.-Col. W. D. (I.M.S.)	Europe.
Roberts, A. A. Lane (I.C.S.)	Gurdaspur.
Roberts, Dr. C. L. Digby	Mariani, Assam.
Roberts, H. V. H.	Karachi.
Robertson, Lawrence (C.S.I., I.C.S.)	England.
Robinson, A. C.	England.
Robinson, H. C.	Kuala Lumpur.
Robinson, Capt. J. A.	Miranshah.
Robinson, J. B.	Sagrampur.
Robinson, G. C.	Mercara.
Rodger, A. (I.F.S., O.B.E.)	Dehra Dun.
Rogers, C. G. (I.F.S.)	London,

Rogers, Rev. K. St. A. (C.M.S.)	Nairobi.
Rogerson, A. M.	Rangoon.
Rondano, Rev. A. (S.J.)	Mangalore.
Roosevelt, Kermit	New York.
Roosevelt, Col. Theodore	New York.
Ross, Major Tyrell (*Life Member*)	England.
Ross, Major E. J.	Dehra Dun.
Roumania, H. R. H. The Crown Prince Carol (*Life Member*)	Roumania.
Row, Lt.-Col. G. R. (I.A.)	Shillong.
Row, Dr. R. (M.D.)	Bombay.
Rowland, J. W. (I.P.)	Satara.
Rowlands, R. D.	Bombay.
Rowlandson, B. C.	Bombay.
Rowson, C.	Europe.
Rowson, W. S.	Vandiperiyar.
Roy, N.	Dacca.
Roy, R. Trevor	Pegu.
Rozalla, A. A.	Simla.
Ruddle, W. H.	Madras.
Russell, Lt.-Col. G. H. (C.I.E., D.S.O.)	Ambala.
Russell, Major J. Bertrand	Saklaspur.
Ruttledge, Capt. R. F. (M.C.)	Peshawar.
Ryan, J. G.	Cawnpore.
Salkeld, Lt.-Col R. E.	England.
Sanders, D. F.	Calcutta.
Sanders, Major C. W. (*Life Member*)	Jullunder.
Sanderson, P. M. D. (F.Z.S.)	Calcutta.
Sandilands, Dr. J. E. (M.C., M.A., M.D.)	Bombay.
Sangli, Shrimant Chintamanrao Appasaheb Patwardhan (*Life Member*)	Sangli.
Sant, Maharana Shri Jarwar Sinhji Raja Saheb of	Sant-Rampur.
Sarangarh, Raja Bahadur Jawahir Singh	Sarangarh.
Sarawak Museum, The Curator	Kuching.
Satya Churn Law, Dr. (M.A., B.L., Ph.D., F.Z.S., M.B.O.U.)	Calcutta.
Saunders, H. F.	Madura.
Saunders, L.	Koraput.
Saunders, Lt.-Col. F. W. (R.E.)	London.
Sausman, V. A. N.	Vaghai.
Savantwadi, H. H., The Sardesai	Savantwadi.
Savile, L. H. (C.B.) (*Life Member*)	London.
Sawyer, H. H.	Bombay.
Scale, Major J. D. (D.S.O., O.B.E.)	England.
Schmid, W. (*Life Member*)	Bombay.
Schomberg, Lt.-Col. R. C. F. (D.S.O.)	Nowshera.
Scott, A. G.	Jubbulpore.
Scott, C. W. (I.F.S.)	Insein.
Scott, Major F. B. (I.A.)	Bombay.
Scroope, Capt. C. F.	Bombay.
Searight, Capt. E. E. G. L. (M.C., R.E.)	Roorkee.

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GEOMETRIDÆ FROM UPPER BURMA

Explanation of Plate I

To face Plate I on page 129 of this Volume.

Fig.	1.	*Gelasma chromatocrossa,*	Prout,	sp. n.
,,	2.	*Nothomiza aegriviridis,*	,,	,,
,,	3.	*Comibæna swanni,*	,,	,,
,,	4.	*Pœcilasthena burmensis,*	,,	,,
,,	5.	*Hydrelia opedogramma,*	,,	,,
,,	6.	*Thera cyphoschema,*	,,	,,
,,	7.	*Organopoda brevipalpis,*	,,	,,
,,	8.	*Sterrha lamprotis,*	,,	,,
,,	9.	,, *castelli,*	,,	,,
,,	10.	*Heterostegania thamina,*	,,	,,
,,	11.	*Triphosa consona,*	,,	,,
,,	12.	*Terpna vigil,*	,,	,,
,,	13.	*Opisthograptis swanni,*	,,	,,
,,	14.	*Hypochrosis eurynota,*	,,	,,
,,	15.	*Lampropteryx opistholasia.*	,,	,,
,,	16.	*Swannia marmarea,*	,,	,,
,,	17.	*Bapta aluta,*	,,	,,
,,	18.	*Lomographa tenebrimedia,*	,,	,,
,,	19.	*Cœnotephria mononyssa,*	,,	,,
,,	20.	*Chiasmia levata,*	,,	,,
,,	21.	*Tasta argozona,*	,,	,,
,,	22.	*Nothomiza ithyterma,*	,,	,,
,,	23.	*Hydrelia enisaria,*	,,	,,
,,	24.	*Rhinoprora xanthocomes,*	,,	,,

NOTES ON THE BIRDS OF THE SIKKIM HIMALAYAS

Additions and Corrections

Volume XXIX

P. 504, line 20 from the bottom. Additional matter having been inserted in my MS., this sentence should read 'Since the first volume of Oates's *Fauna* was published in 1889, our knowledge has advanced from several bases, excepting in regard to Pterylography, i.e., the study of the Pterylosis (the distribution of the feather-tracts (*pterylæ*), in opposition to the featherless interspaces (*apteria*), which is of importance in nestling birds as an aid to classification, a branch of Ornithology.'

P. 507, line 10 from the bottom. *Delete* 'which' *after* 'Suthoras'; and *delete* the 'semicolon' *after* '*and*.' My MS reads: 'Crow-Tits and Suthoras are just as dependent on reed and bamboo-growth, — as Nutcrackers, Crossbills, and are generally considered as occurring exclusively in the pine forests.'

Delete the brackets enclosing the name of the describer of the bird in Nos. 1, 2, 3, 4, 8, 11, 14, 18, 22, 24, 26, 27, 39, 41, 46, 47, 48, 49, 51, 53, 55, 56, 57, 59, 60, 62, 67, 68, 70, 71, 72, 74, 75, 76, 77, 81, 83, 85, 86, 89, 91, 92, 93, 96, 131, 133, 143, as the generic name employed is that in his original description.

P. 515, line 5 from the top. *Delete* 'A.' and read: 'Chelura'. Transfer 'A' to p. 517, line 4 from the top, and *read* 'A flock.'

No. 11. *Nucifraga hemispilla* is possibly best treated as a distinct species with its own group of forms; especially as 'multipunctata' occupies an intervening area between 'caryocatactes' and 'hemispila', and is a good species.

No. 15. *Read* 'PARUS MONTICOLUS LEPCHARUM, Meinertzhagen.
Bull. B.O.C. vol. xlvi, p. 96, April 1926.'

No. 16. *Read* 'AEGITHALISCUS CONCINNA RUBRICAPILLUS, Ticehurst.
Bull. B.O.C. vol. xlvi, p. 22, October 1925.'

No. 17. In the original description IOUSCHISTOS.

No. 24. *Read* 'AEMODIUS'.

P. 726, line 20 from the bottom. *Delete* '14.6.'

P. 727, line 6 from the bottom. *For* 'Second Reference "3,600 feet", *read* "3,800 feet."

No. 32. CŒRULATUS.

No. 39. *Substitute* 'Hodgson' *for* 'Oates.'

No. 41. *Substitute* 'Blyth' *for* 'Hodgson.'

No. 50. XIPHIRHYNCHUS should be valid yet not confused with the genus *Xiphorhynchus*.

No. 67. *Substitute* 'Blyth' *for* 'Hodgson.'

P. 735, line 1, SIBIINÆ.

No. 72. The Hoary Bar-wing. *Substitute* 'Gould' *for* 'Hodgson.'

No. 82. LEIOTHRIX LUTEA CALIPYGA.

P. 737, line 1 from the bottom, 'Calipyga.'

P. 739, line 16 from the bottom. *Insert after* 'under', 'each'; line 7, 'Flower-pecker.'

No. 93. In original description. IGNOTINCA.

No. 104. SITTA CASTANEIVENTRIS CINNAMOVENTRIS, Blyth.

No. 108. MACROCERCUS.

P. 1009, line 7 from the bottom. *Delete* ' many ' and *substitute* ' and '.

P. 1010, line 21 from the top. *P. rufonuchalis beavani* and *P. d. dichrous.*

No. 125. *Read* ' PNŒPYGA ALBIVENTER ' Hodgson, *J. A. S. B.*, February 1837. See Kinnear, *Bull. B. O. C.*, vol. xlv, p. 9.'

No. 126. PNŒPYGA.

No. 127. *Read* ' REGULUS REGULUS SIKKIMENSIS, Meintz.
Bull. B. O. C. vol. xlvi, p. 97, April 1926.'

No. 128. *Read* ' CEPHALOPYRUS FLAMMICEPS SATURATUS, Whistler.
Bull. B. O. C. vol. xlv, p. 15, October 1924.

No. 133. ATROGULARIS.

No. 137. AEDON.

P. 1021, bottom line. *Delete* ' hills ' and *insert*, ' this.'

P. 1022, line 11 from the top. *Delete* ' Ibis ' and *insert*, ' Ibid.'

P. 1023, line 14 from the bottom. *Delete* ' is ' and *insert* ' was '

P. 1026, line 15 from the bottom. *Delete* ' steel transparent.'

P. 1029, line 5 from the top. *After* ' Sikkim ' *add*, ' in the National Collection.' Line 13, ♂, April 4, 1912.

vol. xxx, page 56, line 6 from the top. *Delete* ' 5,' *Read* ' ♂ March 30. 1918.'

P. 57, line 3 from the top : *Caryota.*

No. 182. Most probably best treated as a good species. In Tonkin, both *indicus* and *tenuirostris* occur at similar levels during the breeding season *indicus* being confined to the heavily forested region, while *tenuirostris* occupies the surrounding tracts of a more open character.

Page 60, line 5 from the bottom. *Read* ' ♀ † October 2, 1919.'

Page 61, line 7 from the top.' † Four '

No. 203. *Read* ' CYORNIS MELANOLEUCA, Blyth. = *Muscicapa collini*, Roths *Bull. B. O. C.*, vol. xlv, pp. 89, 90.'

Page 62. For ' *C. blythi* ', read ' *C. melanoleuca.*'

Page 65, line 30 from the top. *Read* ' 10,160 feet.'

Page 66, line 10 from the top. TERPSIPHONE.

No. 222. *Read* ' This Chat which ascends the hills of the outer ranges in Sikkim, to breed at moderate elevations, is provisionally retained under *indica* ; but my two specimens are very diminutive : wing, ♂ 66·5 ; ♀ 64 mm. It is represented in the National Collection by many other similar specimens from Sikkim.'

No. 223. *Read* ' The Turkestan Bush-Chat. SAXICOLA PRZEWALSKII (Pleske).' I relegate all specimens of this cold weather migrant to the Plains of Assam and the outer hills of Sikkim under *przewalskii*. My specimens are certainly not *stejnegeri*. Both *przewalskii* and *stejnegeri* breed in the mountains of Tonkin with somewhat similar zonal distributions, or at all events of a none too excessive variation, *stejnegeri* being confined mainly to lower limits. For this reason I retain *przewalskii* as a good species. I regard the breeding Chat from Yunnan as nearer to *stejnegeri* than *indica*, wherealso *przewalskii* is certain to breed as the Tonkin specimen with eggs which I obtained was collected on the Yunnan frontier.

No. 229. IMMACULATUS.

No. 238. Güldenstadt.

Page 355, line 22 from the bottom. To ' *Oriolus trailii* ' also add ' the male of *Irena puella.*'

Nos. 281, 282. LAISCOPUS.

No. 284. *Substitute* ' Moore ' *for* ' Hodgson.'

No. 290. I follow Whistler and treat this Grosbeak as a good species. *Ibid.* vol. xxx, pp. 701-2.

No. 297. LOXIA.

Page 372, line 24 from the bottom. *Delete* ' more ' and *insert* ' were.'

Page 377, line 26 from the top. *alboides.*

No. 411. FUCIPHAGA.

No. 421. SPARVERIOIDES.

No. 459. GYPÆTUS.

No. 461. HIERAÆTUS.

No. 464. SPIZÆTUS.

Page 884, line 25 from the bottom. *Ilerda.*

Page 887, line 30 from the bottom. ' diminishing '.

Line 26, ' depredations '.

Line 17, ' smashed.'

Page 888, line 5 from the top. rocky.'

Line 2 from the bottom : ' has.'

No. 520. *Read* ' TETRAOGALLUS TIBETANUS AQUILONIFER, Meintz. *Bull. B. O. C.*, vol. xlvi, pp. 99, 100, April 1926.'

H. S.

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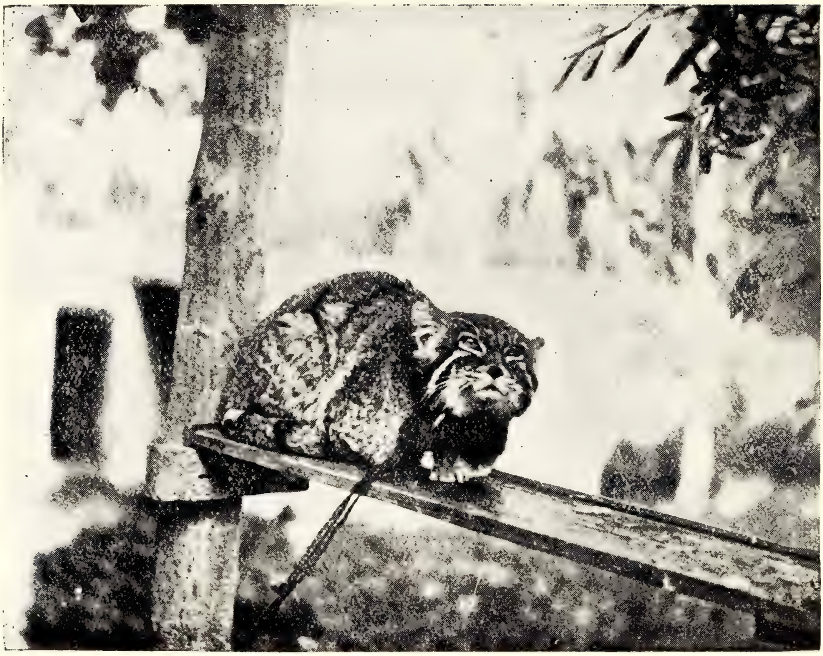

PALLAS'S CAT (*Felis manul*) FROM THE NUTRA VALLEY

7′ 8″ LEOPARD FROM PLAINS OF INDIA

JOURNAL

OF THE

Bombay Natural History Society

MAY, 1926 VOL. XXXI No. 1

THE MAMMALS AND BIRDS OF KASHMIR AND THE ADJACENT HILL PROVINCES

BEING

NATURAL HISTORY NOTES

BY

COL. A. E. WARD

PART VI

(*With a plate*)

Continued from page 724 of Vol. XXX)

CARNIVORA

Family—*Felidae.*

THE TIGER—*Felis tigris.*

The Tiger has not as far as I can ascertain been met with anywhere near Kashmir for years past.

Habitat.—In most of the large jungles of Hindustan and in Burma, but not in Ceylon. In many parts of Central Asia, in the extreme north of Persia and in China. In India it is chiefly confined to hilly and rocky ground which is difficult of access, and where locomotion is not easy, or else, to dense grass-covered swamps. In Manchuria, the Manchurian variety *Felis tigris mongolica* is eagerly sought after but is rarely shot. Skin measurements of this race are not very plentiful, very rarely the pelts get into the market. The pelt of a tiger which has taken to living in the higher hills of the Himalaya is almost, if not quite, as handsome a trophy as that of the Manchurian race.

It is useless to enter into a discussion on the size of tigers in India. A tiger which measured 9 ft. 10 in. is the finest I have shot

—but two tigers of 10 ft. 4 in. *measured along the curves*, one killed by Col. Gordon, were far heavier and had finer heads.

A tiger which was shot by Mr. Whymper in the Terai has the longest measurement I personally know of—the measurement *along the curves* was over 10 ft. 5½ in.

There are probably tigers which weigh as much as 500 to 600 lbs., but I have not the list of weights by me. I remember one of 545 lbs. Sir John Hewett records a tiger which weighed 570 lbs., and a tigress which weighed 347 lbs. A fine C. P. Tiger shot by Mr. Dunbar Brander and now set up in the Prince of Wales' Museum, Bombay, weighed 500 lbs. and measured 9 ft. 11 in.

So many authors have described the fine sport to be obtained after tigers that it is useless to write more.

THE LEOPARD OR PANTHER.—*F. pardus.*

Vernacular names—*Chita*, *Tendwa*, *etc.*

Habitat.—Throughout India, very rare in really cold hilly country. The leopard does not mind a moderate amount of snow, but will not winter in high hills here its place is taken by the Ounce or Snow Leopard *F. uncia*. Its crouching, stealthy habits and its capacity for great speed makes the leopard a bewildering animal to deal with. When completely non-plussed, it fights fiercely and when wounded or forced to stand at bay is never to be trusted, by which I mean that it is impossible to say what it may or may not do under different circumstances. If ' treed ' by dogs the leopard tries to conceal itself, especially in thick foliage or by crouching along a branch.

Measurements.—These are practically of no use as far as publication is concerned—except for purposes of compilation by Rowland Ward & Co., the Bombay Natural History Society, or by parties of sportsmen who are accustomed to shoot together and who are in a position to know exactly how the measurements were taken.

Lay a leopard in the grass and measure it, then move to slightly irregular ground where the surface is uneven and the difference may be fully an inch—Records are kept to fractions of an inch, look over any list and you will find that the difference of ¼ in. may constitute a record. Records which vary so little are useless. True sport consists in the stalk and the beat, either by coolies or by elephants. Once the animal is bagged, the real joy is in talking over the beat at dinner or over the camp fire. The pleasure of possessing a trophy is not so much in owning it, as in remembering pals and the jungle and forest.

According to known records, you may be the proud possessor of the finest head or skin, whereas the real record might be quite possibly elsewhere. Where is the record black buck head ? Very few know that it is owned by a sportsman too modest to record it !

A full grown male leopard may be from 6′ 9″ to 8′, an eight-foot leopard measured between pegs is very uncommon. A female may be from 6 ft. 3 in. to about 7 ft. in length or even longer.

In Rowland Ward's *Records of Big Game* (8th Edition, page 491) —a measurement of 8 ft. 3 in.—8 ft. is recorded of two specimens at least; and then we have 7 ft. 6 in.–7 ft. 5½ in.; 7·1–7 ft. recorded over and over again. I can only say that I do not understand how the different measurements can be applied to the same animal.

Weights.—Weight of males, full grown, from 120 to 160 lbs. Weight of females about 65 to 90 lbs.

A male rarely stands over 3 feet. One standing 2 ft. 10 in. was a very fine specimen. It may be said that most leopards are missed by shooting over them.

Skulls (Rowland Ward).—Basal length up to 11¼ in.

The skull of the next species is not much under 8 in.

In the Society's Journal (volume xxvii, page 934) there is a record of a skull which has a basal length of 11·3 in. which is the largest hitherto recorded in India.

THE OUNCE OR SNOW LEOPARD—*Felis uncia.*

Vernacular names—*Bharal h'aye* in the Sutlej and its tributaries; in Tibet '*Stean*'; in Baltistan '*Sah*'; the '*Safed Chita*' in Kashmir or *Suth Chita.*

Habitat.—The Highlands of Central Asia, including Kashmir, Baltistan, Ladak. Tibet and eastwards to China. It is far more numerous than is generally supposed.

In winter it has been shot at an elevation of about 6,000′. Like all animals there is a limit to the amount of snow through which it can travel: the only limit at high elevations for the Ounce is where game cannot dwell—that is, where no herbage can grow.

Measurements.—Nearly all measurements are from cured skins. The following was recorded by me (Journ., Bom. Nat. Hist. Soc., vol. xxix, p. 30)—length 8 ft. 7 in.; body 5 ft., tail 3 ft. 7 in. The largest Ounce I have seen was probably about 7 ft. 3 in. to 7 ft. 6 in. —the only way I could measure it was by placing a stick outside the bars of the cage parallel to the animal, it was tame enough but kept moving in expectancy of a bowl of milk and blood which an idiotic keeper was holding behind me.

Easily kept in captivity, though very treacherous even when well fed. The Ounce sleeps very soundly during the day but requires dense shade for the greater part of the time.

THE MARBLED CAT—*Felis marmorata*

Habitat.—Sikkim, Eastern Himalayas and the hill ranges of Assam, Burma and the Malay countries. It is strange that it is not recorded from Nepal—I have seen a number of skins which were said to have been brought through Almora (U. P.), from Nepal.

Blanford describes the colouring as 'brownish grey to bright yellowish or rufous brown—(the skins I have seen were by no means bright yellow). Along the back are angular black patches. The legs and tail are spotted black on the outside, the chest and inside the legs are usually spotted, cheek stripes are present. The stomach is brown.

Measurements.—The measurements are quoted from Blanford.

Body 18½ to 23 in.; tail 14 in. to 15½ in. Skull—basal length 2·95 in.—zygomatic breadth 2·6 in. In size somewhat larger than the Leopard Cat. Much smaller than the Golden Cat.

THE GOLDEN CAT—*Felis temmincki.*

Habitat.—Nepal, Eastern Himalayas and parts of Tibet, Burma and the Malay Region.

Colour.—The Golden Cats whose pelts I have seen were all of the *nigrescens* variety. One pelt was deep reddish brown with the chin and under the tail nearly white, the breast was marked with spots darker than the other fur, but not very distinctly. The cheek stripes were buff ; ears nearly black or very nearly so with a brownish tinge. Another skin was a deep brownish black with very little white, the colour beneath being light brown. The fur in all the specimens I have seen was brown at the base.

Measurements.—Hodgson's measurements are :—

Head and body 31·5 in., tail 19 in. ; height at shoulder 17 in. ; ear 2·5 in. Skull, zygomatic width 3·65 in. ; basal length 4·8 in.

Thus the Golden Cat is very much bigger than the Marbled Cat.

It is almost impossible to obtain the skins of any of these wild cats in a reasonable condition, hence the somewhat meagre description given.

THE FISHING CAT.—*Felis viverinna.*

Vernacular names—*Bagh—Mach bagral.*

Habitat.—According to Blanford, Bengal, Orissa and the Indo-Gangetic Plain along the base of the Himalayas. The Fishing Cat has been obtained in the Kumaon Terai, in Nepal and throughout Burma, S. China and the Malay Peninsula.

Colour.—Brownish to greyish, generally brown on the back, lighter on the stomach, spotted all over the body. When the spots are quite black this is a very handsome cat.

There are several distinct black lines from the front of the head to the nape of the neck ; the shoulders have lines on them in addition to the spots. The last is marked crossways with black above.

This cat is very much of the same size as the Golden Cat : both are large but the former is shorter in the leg than is the Golden Cat.

In some parts of India it is called the 'Tiger Cat,' probably because of its fierceness and size—it is a spotted not a striped cat.

Dimensions.—Head and body over 30 in. ; tail with hair about 12 in. ; height about 14 in. to 15 in., rarely more. Weight of a very large cat is 18 lbs. Skull up to 5 in. in basal length, and about 3½ in. in zygomatic width.

The Fishing Cat varies very much in size. So much so that many native shikaris insist on regarding it as a larger variety of the next species described.

THE LEOPARD CAT—*Felis bengalensis.*

Vernacular names—*Chita billi*, *Chitta biral ; Ban-billa.*

Habitat.—Practically throughout the Himalayas as far west as Nepal—in parts of China and Central Asia and in Assam and the forest regions of India. I have never been able to see a specimen from Kashmir.

Colour.—Taking into consideration the numbers of phases of this cat it is impossible to adopt any definite form of colouring. The general colouring varies from reddish or yellowish to greyish with white on the stomach—all have blackish spots of almost a rectangular shape on the back and sides—the front of the legs spotted blackish; the tails cross-barred on the upper surface, the lower surface of the tail is practically unspotted in all the specimens I have seen. There is a white line from the eye to the forehead—In some forms glossy bands of black, showing plainly, extend from the tip of the forehead and over the head to the shoulders. The cheek stripes are two in number; when these are deep black and the bands and spots are the same, the pelt is very handsome.

The Nepal race formerly described as *F. nepalensis*, is often a very different looking cat to the typical *F. bengalensis*, the skin is more covered with spots and it is much more a spotted than a banded cat. Again between these two phases there are others more or less greyer or of a pale red ground colouring.

In 1923 I spent some hours during which I sorted out large piles of cat skins in the furriers shops in Srinagar, amongst the pelts I at last came on the beautiful specimen described on page 32, volume xxix, No. 1, Bom. Nat. Hist. Society's Journal, which I am convinced never came from Kashmir, this was out and out the prettiest skin I have ever seen, for the light tawny ground colour—much in evidence—showed up the deep glossy black of the bands and spots. I spread it on the table hesitating whether I should keep it or not, but finally gave it back to the furriers, and by now it has been probably sold as the skin of a new species of cat, or perhaps as a young tiger cub's pelt. This skin was small, probably that of a young male at its best.

In Kishtwar I got a cat which was undoubtedly a leopard cat, in that district many curious finds are made, the low ground is warm enough for most heat loving animals, whilst above rise magnificent mountains.

Measurements.—Any length of head and body from, say 18 to 24 in. may be met with, any leopard cat over 24 in. is very large—Skulls vary greatly but all appear to be smaller than that of the marbled cat.

The leopard cat when kept in a cage generally gets into the corner, and will spring at the wire netting, with its fore legs extended and the claws unsheathed.

THE RUSTY SPOTTED CAT—*Felis rubiginosa.*

May be passed over with a few remarks—It is never found in any of the provinces with which we are dealing—a pelt may from time to time, come to Srinagar.

It is of a tawny or reddish grey colour, spotted sparsely throughout with broken dark lines along the top of the neck and at the shoulder. Blanford gives the following measurements: Head and body 16 to 18 in., tail 9·5 in.

This cat is smaller than the leopard cat.

Pallas's Cat—*Felis manul.*

Habitat.—Pallas's Cat is found in the eastern part of Ladak extending into Tibet far across Central Asia. It is sometimes called the Silver-tipped cat, from the whitish hairs which mingle with the buff coloured hairs and give a silvery colour to the whole animal.

The muzzle is very broad, giving this cat's head a rounded appearance.

Colour.—I have not seen a sufficient number of the pelts to enable me to give a definite opinion, but I should call the colour silvery grey to yellowish buff, there is very little yellow to be seen—The silver tips are mingled with a buffish brown. The ends of the long hairs have white with black tips, this gives the whole body an appearance of silvery light black. The tail is circled by black rings, and has a jet black tip—The top of the head is marked with spots which in some specimens are very dark coloured.

Dimensions.—Hodgson gives head and body 18¾ in., tail 8½ in., height 9 in., ear 1 $\frac{3}{16}$ in. Weight 6 to 7½ lbs. This weight also is small—however it is near enough to stand. Pallas's cat looks much larger than it really is—it is a cat that loves to be comfortable. The live specimen I had became very tame, but disliked being interviewed, especially by strangers.

The Indian Desert Cat—*Felis ornata.*

Habitat.—Common in the drier regions of Sind, the Punjab and Rajputana.

Colour.—Generally of a sandy colour. The whole body is speckled with elongated spots. I have never seen any round spots on the pelts. The ends of the hairs are very pale. The fore legs are marked with irregular black lines; inside the forearm there are black broadish lines—The cheek stripes are very clearly marked, but do not show up well as they approximate to the general colouring of this cat. The tail has about seven black cross lines which form complete rings towards the tip of the tail.

The ears are very pointed, the tips are not tufted, but have quite discernible hairs at the tips. The soles of the feet are black. *Felis ornata* is very easily recognized by the ears and the black sole of the paws.

Blanford's figured specimen is much darker than are the specimens I have shot, probably because the cats secured by me were obtained in the hottest parts of Sindh—very likely those from the C. P. are darker as they are found nearer bush jungle.

Dimensions.—Head and body 20 to 21 in.—tail 9 in., skull from 3 to 3¼ in., basal length, zygomatic width 2·65 in.

I know nothing of *F. shawiana* except that it is found in Turkestan and to the eastward. The skins brought from there are mangled so greatly as to be useless.

The Waved Cat—*Felis torquata.*

Vernacular name—*Chita billi.*

Habitat.—Very common in Kashmir extending into Afghanistan. A cat with rounded ears, as thus readily distinguishable from *F. ornata* in which the ears are pointed.

Colour.—Brownish to rufescent, lower parts buff, hair with whitish tips. The cheeks are marked with many bands. The markings on the crown and back are generally distinct, some are much spotted. Tail with indistinct black rings and a black tip. Paws nearly always brown beneath. One of the commonest cats in Kashmir.

Measurements.—Head and body 21 in. ; tail 11 in. to 12 in. Skull basal length 2·8 in. ; zygomatic breadth 2·2 in. I cannot understand how this cat can be mistaken for any other.

Nothing will stop the furriers from selling the pelts of the cats as that of a young leopard cub, if a higher price can be thus obtained.

The usual auction price of the Waved Cat's skin is about 12 as. to Rs. 1-4-0—this alone demonstrates how abundantly it is to be found—It inhabits bush jungle, old buildings or rocks wherever it can find shelter.

THE JUNGLE CAT—*Felis chaus.*

Vernacular name—In Kashmir often called *Van-billi.*

Habitat.—Very common in Kashmir up to a level of 6,000 ft. and generally throughout India—Numerous round Srinagar where it frequently interbreeds with domestic cats so that hybrids are common. Of 4 shot this year one had a longish tail like the common semi-domestic cat, but was much more heavily built throughout.

Colour.—Body grey to sandy-grey or yellowish-grey but generally grey—the back is decidedly darker. Blanford's term ' dusky ' describes the back of this cat admirably. The legs are marked transversely with dark greyish. Paws brown or dark grey beneath : in almost all skins more or less indistinct spots are visible on the sides. Most of those skins which have no spots are hybrids being a cross with the grey village cat.

Measurements.—Size, 24 in. to 35 in. at least (head and body), tail about 10 in. — a large cat is about 18 in. at the shoulder. The skull is large but varies greatly.

In weight it much exceeds a domestic cat, those lately killed vary from 9 lbs. to 14 lbs. in weight—One gigantic specimen was said to weigh 26 lbs. I have weighed jungle cats up to 16 lbs.

Ears with long hairs almost amounting to a tuft hence called by furriers ' Lynx cat.'

In Kashmir in winter this cat shelters in the reeds surrounding the swamps and lakes, but as a rule it lives in fairly open bush jungle or amongst rocks and old buildings. Most old buildings in Srinagar are inhabited by the cat.

Felis chaus lives on poultry, chukor, and rats, it eats frogs when driven by hunger. I cannot say when this cat breeds, apparently at any time except in mid-winter.

THE CARACAL—*Felis caracal.*

Vernacular names—In the C. P., *Siyah-gush*—in Baltistan, ' *Ech.*'

Habitat.—Punjab, Sind, North-west and Central India ; Bale met it in China—Higher in the Upper Indus Valley (Baltistan).

Blanford notes, ' Perhaps only tamed specimens,' but any one who knows better would probably say that they are very unlikely to have acquired tame caracals and the question arises how could they transport the animals there. Blanford notes Mesopotamia as the habitat of the caracal, this has been confirmed—he also mentions the highlands of Persia, Arabia and Africa.

Colour.—Rufous in colour with dark tips to the fur as a rule, but this is not constant—ears outside black, inside white. The vernacular name ' *Siyah Gush* ' signifies black ear.

Measurements.—Dunbar Brander gives the height of a Caracal as 18 in. for the shoulder measurement of a good specimen.[1] Rowland Ward gives the flat skin of a caracal from Africa [2] as 46½ in. (owner's measurements)—A. E. Ward gives the body plus tail of two specimens as body and tail 36½ in. and 38 in. and height as 17 in. and 17½ in. This is not much to go upon, but possibly the African animal is larger than the Indian.

The caracal is as far as I know rare in India. I have only come on two alive and one cured skin. The caracal is smaller than the lynx, it has the dentition of the lynx.

THE LYNX—*Felis lynx.* var. *isabellina.*

Vernacular names—In the Doon ' *Jungle Billi* ' ; in Baltistan ' *Ee* '.

Habitat.—The Northern Himalayas including Ladak and Tibet and Central Asia—Common in the Nulra Valley in Ladak. Several Tibetan lynx have been caught and sent to Europe. In India the red variety is or was often kept in semi-captivity, but in Kashmir I have never seen *Felis isabellina* let loose. The Tibetan lynx is more difficult to tame than the Indian lynx.

Colouring.—The Lynx has a long black tuft at the extremity of its ears. The colouring is very variable, from the red of the Indian variety to pale grey with reddish or fawn markings of the Himalayan animal. Many are spotted nearly black. I have never seen a skin amongst scores I have come across that absolutely showed white spots. The ears are grey, fringed with black. The fur of *F. isabellina* is soft and thick, good pelts fetch from Rs. 20 to 50 each, and make excellent carriage rugs.

Measurements.—The Lynx (*F. lynx isabellina*) is a powerfully built, heavy cat weighing as much or nearly as much as a small leopardess, and measuring head and body about 3′10″. Blanford gives 2′9″, tail 7¾ in.—weight about 60 lbs., which is nearly the same as I gave years ago as the weight of a very large lynx belonging to Mr. Johnson, Wazir of Ladak.

VIVERIDAE

THE LARGE INDIAN CIVET—*Viverra zibetha.*

The only vernacular name I know of is *Nil Biral.*

Habitat.—This is the only civet I have shot and trapped in Kashmir. It occurs in Nepal, Sikkim, Bengal, Assam, Burma,

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[1] *Wild Animals of Central India*, p. 273.

[2] *Rowland Ward Record of Big Game* (8th ed.), p. 497.

S. China and Malay countries. It is very rare in Kashmir, but it occasionally to be found towards Chamba. It extends into China. Skins said to have come from Tibet are to be found in Srinagar, these probably come from Bengal.

Colour.—The nose is pointed at the nostrils, a black line extends upwards from the nose to the ears, and from the ears to the tail runs a partially erect crest of coarse hair, generally blackish in colouration. The tail is banded alternately with broad dark and narrow white rings. The throat is black, the neck black and white, generally the black on the lower throat is separated from the shoulders by a white line, the shoulders are marked with a succession of dark stripes. The general colouring of the body and sides is a dark dirty looking grey. Narrow stripes exist on the lower buttocks. The feet are brown.

Measurements.—Head and body up to 30 in. in Kashmir; tail 17 in. Weight of a Kashmir specimen 22 lbs. Blanford gives skull measurement as 5·25 in. basal length; 2·7 in. zygomatic breadth. This is far larger than I have seen in the Western Himalayas.

A very destructive animal, practically carnivorous. Breeding season summer months; the young are hard to find. Habits nocturnal, often living under thatched roofs.

Genus—VIVERRICULA

The Small Indian Civet—*Viverricula malaccensis*

Vernacular names—*Bagh-niyal* and of course *Chita Billa.*

Habitat.—Throughout India, rare in the drier regions. It occurs in Burma, S. China and the Malay countries. Skins of this civet brought from China, etc., are often exposed for sale at Srinagar.

Colour.—There is no crest on the back, the general colouring of this civet is greyish brown with a decided tint of yellow—I have no notes on this civet worth quoting, nor does it much interest the readers of these notes, because it is rarely to be found in any of the countries with which we are dealing.

Measurements.—Head and body 21 in., tail long (without hair) 16 in.—weight 6 lbs. These are the measurements of a specimen from the U. P.

Genus—PARADOXURUS

Palm Civet (*Paradoxurus niger* (?))

Vernacular names—*Jar-ka-kutha*; *Bham Bondar.*

Habitat.—Wroughton in his review of the species of Palm Civets described under the names *Paradoxurus niger* and *hermaphroditus* gives the name *niger* to the species which occurs in the southern portions of the Indian Peninsula and Ceylon, while the northern civet is described as a distinct species under the name *crossi.* Since Wroughton's paper was published examples which have been identified as *P. niger* have been obtained through the Society's Mammal Survey in the Kangra Valley and it is quite likely, though it requires confirmation, that the Palm Civet which occurs on the outer ranges of Kashmir and occasionally in the side valleys may also be referable to this species.

Colouring.—Brownish grey. The longer hairs have black tips giving the animal a black and grey colouring. Some very blackish pelts are obtained from the Pir Panjal, those I have obtained in Simla and elsewhere are grey in colour, sometimes with a brownish tinge.

The general colouring is as noted, but some skins are marked with indistinct markings. The old full-grown animals are generally free from spots and lines which are plainly discernible in young specimens. The legs and tail are blackish. Face dark with whitish marks under the eye.

Measurements.—A male, head and body 23 in., tail about 20 in., skull length 4 in., width 2·25 in. A large male killed at Simla measured 24 in. (head and body). Females are smaller, rarely exceeding 19 in. to 20 in.

Habits.—Arboreal, very nocturnal in confinement; if kept in a dark room this animal will sleep throughout the daylight. It will eat almost any food that is offered to it. Very useless as a pet being nearly always asleep.

The Nepal Palm Civet—*Paradoxurus strictus*

Habitat.—This civet is referable to *Paradoxurus hermaphroditus* of Blanford, a name which Wroughton found specifically indeterminable. In his revision of the genus (Journ., B.N.H.S., vol. xxv, p. 49) he applies the name *strictus* to this civet which differs from the preceding species in having the ground colour fulvous instead of grey and spotted. This civet occurs in the Central Region of Nepal whence it ranges eastward through Darjeeling, Bhutan, Dooars and Assam.

Colour.—The fur is long and soft, the stripes and spots are marked in black on a fulvous ground.

The Himalayan Palm Civet—*Paguma grayi*

Habitat.—Blanford included this civet under the genus *Paradoxurus* and placed it in a section by itself on account of the shape of the palate; it is for this reason now recognized as a distinct genus. It occurs in Kashmir, Kumaon and eastward to the Chin Hills. The species occurring in Kashmir and Simla is presumably recognized as a separate race and is said to be darker in colour and to have the head and neck distinctly darker than the rest of the body.

Colour.—The colouring is grey devoid of markings on the body. The hairs terminate in greyish white tips which are occasionally black on the upper parts. There is usually a band under each ear, and another down the nose and a dark spot under each eye. Many animals are more yellowish brown than grey.

Measurements.—A larger animal than *niger*. Blanford gives the head and body as 24–25 in., tail about the same, weight 9–10 lbs.

Sub-family—*HERPESTINAE*

Genus—HERPESTES

The Common Indian Mungoose (*Herpestes mungo*)

Vernacular name—*Nyul.*

Habitat.—Common throughout the Indian Peninsula from the Himalayas to Agra. Various races are recognized.

Colour.—Greyish brown speckled with white or pale grey, sometimes with a ferruginous tinge on the head. The lower parts are paler.

Measurements.—Head and body measurements in Kashmir 15 in. or less.

The Small Indian Mungoose (*Herpestes auropunctatus*)

Vernacular names—*Mayas, Nil* and *Nyul.*

Habitat.—Three races are recognized of which the typical race *H. auropunctatus auropunctatus* occurs in the Lower Himalayas from Sikkim to Kashmir, Bhutan, Dooars, Bengal and Orissa.

Colour.—Grey brown generally speckled yellow.

Measurements.—Head and body rather less than 12 in. Weight about 10 oz. to a little over a lb.

(*To be continued*)

FACTS AND HYPOTHESES IN THE PROBLEM OF EVOLUTION

Presidential address delivered before the Botany Section of the Indian Science Congress, January 6, 1926.

BY

E. Blatter, s.j., Ph.D., f.l.s.

Botany is an empirical science, the plant its object. What we see and observe in the plant forms the contents of botany ; but we are not thinking of our observations as raw material, but as facts to be connected by the process of thinking and cleared up by scientific interpretation. This leads up from the raw material to the crystallization of a small number of well-founded sentences by which we give expression to facts or present the efficacy of the laws of nature. A heap of types is not a book ; in the same way, the mere accumulation of facts is not science. The economy of our thinking forces us to abstract general ideas from the variety of objects, and, again, to combine those ideas into general statements of narrower or wider significance, and into laws which may be specific or of a more general nature. This is the way leading to the knowledge of the plant.

How far this ideal is removed from reality is known to everybody who has worked seriously in any branch of botany. The difficulties which stand in the way of the realization of that ideal are many. Some come from the object itself, the plant. In many cases where we are not in a position to formulate laws, we have to be satisfied with mere rules which allow of a wider or more restricted application.

To a great extent the human weakness of the botanist has to be blamed who is ever ready, when experience fails, to fill in the gaps in his knowledge with speculation and who, in his desire for dogmatic finish, is only too often tempted to mix up mere problems with laws based on experimental facts. In order to justify such mistakes he applies the word theory to something that does not even deserve to be called a hypothesis.

A further aberration is caused by the fact that botanists are frequently guided in their judgment by tradition and school-opinion, whilst elimination of errors and search for truth should be the only guiding star. There is no dogma in science to which we should blindly submit.

But we have seen worse things in the botanical world, we have come across fashions. We admit, it is quite justified to strike out in a new direction of investigation after the prevailing interest in botanical research has followed a certain line for some time ; but we cannot see how it works towards progress if the disciples of the new or so-called 'modern' school look down with conceit on the representatives of the old school or, as it is called, the 'antiquated' school, and *vice versa.* There are, e.g., investigations in systematic botany which have been performed with the greatest possible mental acumen and, on the other hand, we meet physiological research whose intellectual value does not rise above a very moderate level. Both, however, help in the interpretation of nature.

But enough of these general considerations. I have put them before you in order that I may find it easier to make myself understood when I speak of the 'Facts and Hypotheses in the Problem of Evolution.'

We are botanists. We know the flora of the present day fairly well, we know its distribution, we know its aspects in various countries, we know a good deal about the migration of its members, we have classified the plants according to artificial systems and we have also tried to classify them according to natural systems. But we want to know more : we want to find out how the present-day vegetation came into existence, whether it is the product of evolution or not.

Whatever may be the answer to this last question, I am not going to discuss the origin of the first plant or plants on this globe. Observation and experimental science cannot give us a direct satisfactory solution of this question ; but biologists have established the axiom : '*Omnis cellula e cellula,*' and we are on firm ground when we conclude that the first cells cannot have evolved from matter, but that they must have been created. I take, therefore, the first plants as given, not determining whether there were few or many, and whether they belonged to one species or to many. And now I put the question again : Is the present-day flora a product of those first plants ?

You all will say : 'Yes,' and I say 'yes' with you. But now let us be absolutely honest, let us forget for a moment that those were great naturalists who put the idea of evolution into the world, let us forget that the whole scientific world *believes* in evolution, (I say on purpose 'believes'), let us forget that evolution has become so to say a universal law invading every domain of human knowledge, let us also forget that almost every fact in the organic world is being studied with a view to ascertain its significance in the great scheme of evolution : and now let us approach the problem without prejuidce, without inclination towards the opinion of this or that school of thought.

1. *Fact and Speculation.*—There is no branch of botany in which the differences are more prominent between experience and speculation, between fact and hypothesis, between knowledge and belief, between scientific and philosophical treatment of the problems, than they are in the field of the theory of evolution. At the same time there is no other field in which, through the mixing up of actual experience with philosophical speculation, there has arisen a greater pseudo-scientific confusion. You must not think that I want to condemn philsophical speculation ; it is justified side by side with experience ; but it becomes unscientific as soon as we

cease to know exactly where experience stops and where speculation begins, when we ignore how much of the theory of evolution is scientific fact and how much is mere philosophical conjecture. It is just here that we should carefully distinguish between the results of observation and the products of our imagination.

2. *Systematic and Historical Treatment.*—The chemist and physicist as well as the botanist are dealing with facts. In physics and chemistry facts that have been ascertained are classified and their mutual relations investigated; laws are recognized only in cases where they have been proved to be constant. In chemistry the elements are accepted as a given variety, so are the forms of energy in physics; we do not inquire into their origin.

But in botany it is the historical consideration that is more prevalent. We consider the plant as the result of an historical process, and by this method botany resembles geology. We want to know, e.g., where the species come from, and we try to find an answer in the theory of evolution.

3. *Two Facts and One Hypothesis.*—The answer which may vary a good deal as regards detail is based on two facts to which evolutionists have added an hypothesis.

The first fact is the uninterrupted continuity of birth in any series of descendents. We can accept this fact without hesitation, as we start from the supposition that the laws of organic formation were the same in former periods as they are at present. If we deny this principle we must also deny to cosmogony, astronomy and geology the right of investigating into the past, because the laws of nature might have changed in course of time.—The second fact is the positive knowledge that in former geological periods our globe was covered with a vegetation which was different from what we see at present.

These are the two facts: continuity of birth and a different vegetation in former periods. Now I ask you, ladies and gentlemen, what can we conclude from these two facts? Nothing at all. Are we justified in drawing the conclusion that our present species are not the product of evolution? Certainly not. Can we conclude that evolution *has* taken place? By no means. The mere fact that the records of palæobotany show us plants which do not exist in our days does not prove anything. That fact would prove evolution if we could show that those fossilized plants were the ancestors of our modern plants. But this is an almost impossible task. Anybody who has followed up the attempt of systematic botanists during the last 40 years will admit the enormous difficulties that stand in the way of working out a genealogical tree or trees. I think there was no botanist, after Bentham and Hooker, who had a better grasp of systematic principles and who tried harder to frame a natural system on the basis of evolution than Engler. And it was he who confessed in the last edition of his *Syllabus der Pflanzenfamilien* (1924): 'Though I expect results from phylogenetic methods in the study of single families, especially with the aid of plant geography, I cannot help being sceptical with regard to many attempts to derive families from one another, either from living or extinct ones.'

But I must not cite authorities. As I said before, our investigation is an independent one.

What then shall we do if the two facts mentioned above do not lead to any conclusion ? We could drop the question altogether ; but this is not satisfactory to the inquisitive mind of a scientist. So the question remains : Are the present-day plants a product of evolution ? As only those two facts are at our disposal and as they revealed themselves to be barren, there is only one solution possible, viz. to call to our aid a hypothesis. We may formulate it in this way : Let us suppose a phylogenetic development of the plants which, on the whole, progresses from single to more compound forms and which is analogous to ontogeny that begins with a fertilized cell and develops into a highly organized body.

This is the hypothesis which is the foundation of every investigation connected with evolution. And it is *only* a hypothesis and nothing more, and the fact that it is called theory of evolution does not change matters in the least. It is a hypothesis and will remain a hypothesis till phylogenetic evolution has been proved to be a fact.

Astronomy and biology have telescopes and microscopes to reveal a variety of things co-existing in space which to the unarmed eye remain hidden, but we do not know of any instrument or method by which we could penetrate or illumine the darkness of the past. We can, however, link up a modest number of facts by philosophical speculations and in this way the treatment of the problem develops into a discussion of possibilities, but never beyond, unless what our hypothesis contains is no more hypothetical but real. As long as we use our hypothesis as a heuristic working hypothesis and do not enunciate it as a scientific dogma, it may bear ample fruit in the tracing of connections between organisms. Just because it has done so up to now, it is of great value even to the purely empirical science.

But it will do harm to human knowledge as soon as we see in it more than a mere hypothesis. We have only to think of the fanciful and wild imagination betrayed by some fanatical defenders of the theory of evolution.

4. *Foundation of Speculation.*—The objective value of every speculation in natural philosophy grows with the number of clearly ascertained facts on which it is based. Considered from this point of view the theory of evolution is not well off.

We gather our facts and observations from two sources : from the fossilized plant world and from the changes which can be observed in the living vegetation. There is no other source, if we want facts!—All the rest is speculation, made up of conclusions from more or less important indications, of the discussion of possibilities and probabilities, in short, of hypotheses which can neither be proved nor refuted.

The amount of material accumulated from both fields (fossil and living vegetation) is great, and still the theory of evolution receives little light from it. The facts are rarely quite univocal, and it is for this reason that there are scarcely two botanists whose convictions as regards the theory of evolution are the same, whilst other speculative domains of natural science, e.g. stereochemistry enjoy the approval and consent of a large number of scientists. This also explains the strange phenomenon that, from time to time, a radical agnosticism in questions relating to evolution is gaining the upper hand. Agnosticism, of course, is the most convenient attitude towards such problems : it saves us the trouble of thinking.

5. *Palæobotany* :—*a. Cryptogams.*—Let us first consider the results of palæontology. The history of the past teaches us without doubt that in former geological periods the vegetation was different from ours. No plants have been preserved in the Pre-Cambrian and Cambrian rocks. The oldest plants, according to our present knowledge, have been found in the Silurian rocks—viz., ferns which resemble those of the present day. But I must not anticipate.

Of the Thallophytes (Algæ, Fungi and Lichens) only those species could be preserved which, by the deposition of calcium carbonate and silica in their cell-walls, formed a skeleton able to be fossilized, whilst the soft species soon became a victim to putrefaction. We find, therefore, amongst fossil Algæ only Diatoms and Chalk-Algæ. The Diatoms go down right to the carboniferous age and they are scarcely distinguishable from the living ones. Of the Chalk-Algæ we must separate two types : the simpler *Siphoneæ* and the more complicated *Corallinaceæ*. The *Siphoneæ* occur already in the Silurian age and amongst them we come across forms which resemble the modern types. Even a living genus (Bornetella) seems to occur in the Silurian rocks. *Corallinaceæ*, on the other hand, are known only from the Jurassic, Cretaceous and Tertiary deposits.

At the present day every organism which is not preserved by special circumstances, succumbs to putrefaction brought about by Bacteria. As we have good reason to assume that the soft parts of plants putrefied already in the oldest strata, we are allowed to draw the conclusion that Bacteria existed in those periods. But we have also direct indications of Bacteria having destroyed wood during the Carboniferous age. Well preserved fossils of Fungi have not been observed, but the Tertiary period has preserved a number of Lichens which agree with existing genera. As the bark of our trees is usually inhabited by Lichens, it is a striking fact that no Lichens have been discovered on the bark of Carboniferous strata. It is not unlikely that Lichens did not exist in that period.

Mosses in greater variety date back to the Tertiary period and they are mostly forms which resemble the Mosses of to-day. Some incomplete fragments, however, seem to have come down to us in the Cretaceous and Jurassic rocks.

Ferns have already been found in Silurian times, i.e., in the oldest formation which contains plant fossils at all. It is interesting to note that those ferns had reached the same degree of organization as ours. From the Silurian rocks upwards we meet ferns everywhere, but they reach the height of development in the Carboniferous period, and it is here where we come across types which are more perfect anatomically than the present ones.

The *Equisetaceæ* show the optimum of development in the

Carboniferous strata. Similarly, the Lycopdiales attained the maximum of form and organization during the same period. *Lepidodendraceæ* and *Sigillariaceæ* become extinct during the Permian and Triassic ages, which also saw the end of the tree-like Calamites.

If we compare all the data of palæontology regarding cryptogamic plants we have to admit that there are no forms which might be considered as connecting links between Algæ and Mosses, or between Mosses and Ferns. On the other hand we notice that all the classes of Pteridophytes reach their maximum development already during the Carboniferous period.

b. Phanerogams.—We come to the Gymnosperms with the families *Coniferæ*, *Cycadaceæ* and *Ginkgoaceæ*.

The oldest Gymnospermous types are the Cordates. Traces have been discovered in Devonian rocks ; after having attained their richest development during the Carboniferous age they are no more found in Permian strata. No other Gymnosperms can, with certainty, be traced in Carboniferous rocks. The first reliable fragments of *Cycadcaeæ* are Permian.

In the Triassic and Jurassic strata we find extinct genera of *Cycadaceæ*, *Ginkgoaceæ* and *Coniferæ*. The maximum of their development coincides with the Jurassic period, which has seen the first still existing Coniferous genus Araucaria. In the Cretaceous rocks numerous genera made their appearance which have continued up to the present day. In the Tertiary strata we find only genera which still exist, and in many cases even species.

No traces of Angiosperms have been discovered in the lower Cretaceous rocks. In the upper strata, however, we meet on a sudden numerous Monocotyledons as well as Dicotyledons which show considerable resemblance to their modern relations. The Tertiary period discloses representatives of still existing families, genera, and species.

What are the results of this short evidence of palæobotany ? No close relationship between the oldest Gymnosperms and Angiosperms can be established. Both phyla of phanerogams are as sharply separated in their fossil types as they are in the living ones. The Angiosperms are very young ; we know them only from Cretaceous rocks. The Gymnosperms may be as old as any plant-remains ; if we do not find them in the Silurian strata it may be explained by the fact that very few land-plants have come down to us from that formation. Later on the Gymnosperms as well as the Angiosperms approach the living types more and more, especially in the Tertiary period. In spite of this it is impossible to trace transition series between Tertiary and living species in a satisfactory way. Wherever such transitions have been constructed they are uncertain and allow of no univocal interpretation.

6. *Variation and Experimental Facts.*—We have dealt with the palæobotanical record. It remains to be seen what observation and experiment in the living plant can tell us regarding the theory of evolution.

When we speak of variation we generally mean three groups of phenomena: (*a*) Individual differences ; (*b*) single variations ;

(*c*) forms produced by crossing and Mendelian segregation. The question before us is this: What influence have these variations on the formation of species?

7. *Individual Differences.*—We call individual differences all fluctuating inequaliites of an individual and of its organs—e. g. the hairiness of the leaves of a plant, the percentage of starch contained in a grain of wheat, and even more important features of a morphological and physiological nature. These differences, whether quantitative, meristic or individually quantitative, oscillate around a certain mean. We are told that useful individual differences can be increased indefinitely by selection and may finally become independent of selection.

But how do we know that everything that is ascribed to selection has come into existence *through* selection? We know many races of cultivated plants, but do we know their origin? Besides, many cultivated forms owe their origin not to the mere strengthening of individual characters, but to crossing and segregation of characters. If we consider only well-attested facts we must arrive at the conclusion that selection does not bring about anything *new* and that the maximum amount of quantitative modification is brought about in a few generations (mostly in three to five) and that only continued selection can maintain this amount. Stopping selection means inducing regression. New species, therefore, cannot arise through selection.

But does not environment influence plants and mould them in many ways? Quite so, but experiments show that changes of characteristics and niceties of adaptation go to and fro without transgressing definite ranges of variation. And how are we going to explain the discontinuity of species in the presence of a continuous environment, whether it has acted directly in the Lamarckian sense, or as a selective agent as explained by Darwin? We would have to call for accidental destruction and isolation of intermediate forms, in other words: a second hypothesis would have to give strength to the first.

8. *Single Variations.*—What is the significance of single variations for the theory of evolution? When from among a large number of offspring some particular individual differs from the rest in one or more characteristics and transmits them to posterity, we speak of single variations and call the whole process mutation. If de Vries's new forms are really new ones, and if future experience shows that they do not owe their origin to some unexpected original cross, then, and then only can we say that single variations are of importance for the solution of the evolution problem, because they are discontinuous and constant and would, therefore, be capable of explaining the gaps between extinct and existing species. But till the possibility of an original cross is completely excluded, de Vries's theory can only be used as a hypothesis in the explanation of evolution. Even when the time comes, when no doubt attaches to de Vries's experiments, there still remains the remarkable fact that the fertility of mutants decreases considerably, and this fact becomes the more pronounced, the greater the deviation from the parent. In addition, the newly

produced mutants are comparatively weak. These two facts require careful consideration when we try to determine the value of single variations for the evolution of species. Finally we must not overlook the fact that those mutants do not exhibit any progressive development. The new forms have not shown the slightest progress in organization, not even indications of any kind of advancement in that direction.

9. *Crosses and Mendelian Segregation.*—We have now to pay a few moments' attention to crosses and Mendelian segregation. As regards cross-breeding in nature we can hardly consider it as a factor in the progressive evolution of species. We know by experience that forms of different degrees of organization do not cross, and even if they did, all deviations would soon be equalized according to the laws of chance and probability.

Apparently greater importance must be attached to the Mendelian segregations. You all know Mendel's rule. A simple analysis reveals three parts : (*a*) By fertilization the characters of the parents are united, but they do not lose their purity and independence ; (*b*) In the offspring the characters of both parents may again be separated from each other ; (*c*) The character of one of the parents may completely conceal that of the other. We know, however, from subsequent investigations that the latter part is not necessarily connected with the rest. I must add that Mendel's rule also holds good for the offspring of hybrids, in which several constant characters are combined. This is a splendid confirmation of the modern theory of the cell.

What is the bearing of Mendel's rule on the theory of evolution ? We cannot deny that it gives support to the idea that gaps in nature can originate through such segregation. But can the idea be applied to the formation of species ? We cannot answer this question at present. One thing, however, is certain, segregation does not bring about any progress in organization or any progressive specific development.

10. *What follows for the Theory of Evolution ?*—Now that we have given a short survey of the facts of variation we naturally wish to draw conclusions. The central idea of modern evolution theories is progressive specific development. I appreciate the enormous amount of work that has been done in the way of elucidating the problems of variation, and we have to be grateful to the botanists and biologists who have put at our disposal an immense number of experimental facts, and we cannot help admiring the acumen and devotion that have been employed in the co-ordination of new observations and discoveries towards the construction and consolidation of the theory of evolution. At the same time I must confess that all the observations gathered from the world of organisms as it now exists does not give any confirmation to the theory which wants to explain the evolution of new species. What we have before us are hundreds of hypotheses ; a few are leading ones, some are subordinate, and others do not even deserve the name of hypothesis. I am not exaggerating when I say that in most of them the speculative element preponderates over facts, and it would not be difficult to show that many are

the product of mere imagination. If the fact-element were more prominent in all the treatises that have been written on evolution by defenders of evolution, botanical literature would not offer so many different views and opinions on the same subject, such a variety of contradictory statements, so many empty terms and meaningless phrases which can only have been coined in dream-land, but especially we would not come across so many personal attacks amongst colleagues which only betray the absence of facts.

11. *Conclusion.*—We have, therefore, not yet a satisfactory reply to the question: How did the present flora come into existence? The greatest difficulty is to explain the origin and constancy of new characters and the teleology of the process. The question as to the transmission of acquired characters is not by any means decided. The doctrine of propagation tells us that only such characters can be transmitted as are contained in the germ-cells or which have been either directly or indirectly transmitted to them. Hence it is clear that all peculiarities acquired by the cells of the body through the influence of environment, or by use or disuse, or any other agent, can only be inherited if they are handed over, so to say, to the germ-cells. But it is useless to discuss the question before we have sufficient experimental evidence that acquired characters are at all inherited.

Darwin's 'natural selection' is only a negative factor when we want to use it for the explanation of the origin of new characters. It is quite true that the plasticity of organisms has been proved by a number of experiments to be considerable. In a constant environment and by single variations changes may be effected which a systematist would classify as specific or even generic, if it were not clear from other sources that they are not such; but at present we are unable to ascertain how far that influence may extend. Lamarck's 'Inheritance of acquired characters' is not yet exactly proved, nor is it evident that really new forms can arise by mutation.

All this does not sound very encouraging. The theory of evolution is no more than a hypothesis, and it is highly unscientific to proclaim evolution as a well-established theory or as a fact, whether this be done in scientific treatises or in popular books. Science does not gain by exaggeration. It will make progress only by drawing legitimate conclusions from facts. We shall serve science much more efficiently by confessing ignorance where there is ignorance, than by constructing a system made up almost entirely by hypotheses, views, opinions, indications, probabilities, and possibilities, and only here and there supported by a meagre fact whose interpretation is only too often ambiguous.

Does this mean that we should give up the theory of evolution? Far from it! I suppose I am right in assuming that you *believe* in evolution! and so do I. I said on purpose 'you *believe* in evolution.' There cannot be a question of conviction for a scientist where not every link leading up to his theory is an established fact or a legitimate conclusion from facts. For us the mere idea of evolution has a peculiar charm. We are surrounded by a variety of organisms which are teaming with problems, whether we find them in geological strata or on the surface of our globe, or in the air, or in the water. We want to find an answer to all the questions which nature itself puts to us. There is especially one mystery the human mind wants to solve, viz., the origin of our species. It is a mystery of absorbing interest, whose solution will throw light into the remotest periods. We are still groping in the dark and sometimes it seems as if the sun would never rise on our mental horizon, as if the past would for ever remain a sealed book to the inquiries of our mind. At present we try to find the solution of that mystery in the theory of evolution. There are many facts and many indications that point in that direction ; we seem to feel that we are on the right path, though we are not as yet able to furnish convincing arguments to establish the truth of evolution. It is a gigantic problem and we may not see its solution.

It is over 100 years since Lamarck offered the world the first theory of evolution. His period ended with an almost complete victory for the theory of constancy (1830). Then came Darwin and gave us his ' Origin of Species ' (1859). His theory entered into every department of the biological sciences and to a great extent transformed them. After Darwin followed a period of critical reaction and we belong to that period. We are not able to say what changes may befall the problem of evolution during the twentieth century. One new discovery may bring a solution we never dreamt of, or it may revolutionize our views and opinions, or it may even destroy our hopes and aspirations to see the theory of evolution confirmed and established. Whatever may happen and whatever the solution may be, we shall never regret having used the theory of evolution as a working hypothesis. It has opened out vast fields for investigation, it has called into life new branches of the biological science, it has given renewed interest to many departments of botany which were threatened to become dry archives of names and descriptions without an intellectual foundation, it has multiplied and perfected the methods of scientific investigation, and above all, it has given an importance even to the smallest detail of scientific knowledge, because there is nothing that has not been requisitioned to serve as a building stone in the construction of the theory of evolution.

SCIENTIFIC RESULTS OF THE MAMMAL SURVEY No. XLV
TWO NEW FLYING SQUIRRELS FROM THE MERGUI ARCHIPELAGO

BY

OLDFIELD THOMAS, F.R.S.

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When working out Mr. Primrose's specimens from the Mergui Archipelago in 1923 I distinguished from *Petaurista mergulus* two other forms of the same general type, described them and sent the MS. to India. This however was never published, and appears to have been lost in the post.[1] On the basis of the named and labelled types however I think it best to publish short diagnoses of the two Flying Squirrels, though I confess that I have now so far forgotten the subject that these diagnoses can only represent such characteristics as readily spring to the eye.

Petaurista mergulus reguli, subsp. n.

Colour throughout quite like typical *mergulus* of Ross and Tavoy Islands, but decidedly larger, as evidenced by the skull measurements.

Dimensions of the type :—

Head and body 440 mm. ; tail 450 ; hindfoot 72 ; ear 40.

Skull, greatest length 70·3 ; condylo incisive length 66 ; zygomatic breadth 47·7 ; nasals 21·5 × 13·5 ; upper cheek teeth, exclusive of p^3. 16.

HAB. King Island, Mergui Archipelago.

Type. Adult female. B.M. No. 23. 1. 6. 50. Original number 49. Collected September 22, 1921, by Mr. C. Primrose. Presented to the Bombay Natural History Society.

Petaurista mergulus primrosei, subsp. n.

Size slightly larger than in true *mergulus*, smaller than in *reguli*. General essential markings as in *mergulus*, but the whole dorsal surface and especially the patagium suffused with deep chestnut rufous.

Dimensions of the type :—

Head and body 425 mm. ; tail 478 ; hindfoot 72 ; ear 38.

Skull, greatest length 68·5 ; condylo-incisive length 63 ; zygomatic breadth 47·5 ; nasals 21·5 × 12·8 ; upper cheek teeth, exclusive of p^3. 14.

HAB. Lampi (otherwise Sullivan) Island, Mergui Archipelago. A specimen also seen from Sir J. Malcolm Island.

Type. Adult female. B.M. No. 23. 1. 6. 53. Original number 507. Collected March 6, 1922, by Mr. C. Primrose, and presented to the Bombay Natural History Society.

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[1] The original MS. was lost in the wreck of the P. & O. S. S. *Egypt*.

THREE MONTHS UP THE VALLEY OF THE SUTLEJ RIVER

BY

LT.-COL. R. W. BURTON, I.A. (RET.)

(*With 4 plates*)

> *Afoot and light-hearted I take to the open road,*
> *Healthy, free, the world before me*
> *The long brown path before me leading wherever I choose.*
>
> WALT WHITMAN.

The advent of the hot weather of the year 1920 was heralded, as usual, by frequent dust storms, increasing heat, and the monotonous, insistent note of the copper-smith 'toiling at his green forge' on the topmost bough of his favourite tree. These annual annoyances were, however, somewhat softened by thoughts of the coming three months in the hills and the joys of the open road.

The 26th April found me travelling by the Punjab Mail, *en route* to Dehra Dun, and it was a good augury, so far as the success of the longed for holiday was concerned, that this train had been preferred to the Allahabad-Dehra-Dun Express, which, leaving my departing station that night at a later hour, ran into a goods train near Moradabad in the early hours of the morning. Many third class passengers were killed, some of them suffering the agonizing fate of being burned to death amidst the splintered woodwork of overturned and blazing carriages.

The change of climate on arrival at Dehra Dun was very marked, the fresh feeling in the air being quite different to the close and oppressive heat of the plains cantonment. Soon after leaving the suburbs of the city a sign-board 'To Arcadia' attracted the eye. It is the name of a tea estate, and was doubtless 'Arcadia' to the people who established themselves there in years gone by. The roadside hedges were bright with dog-roses; the air was fragrant with the scent of blossoming siris and neem; while the leafy avenue of *tūn* trees afforded pleasing shade to the eyes.

The river Asan, crossed by a substantial bridge at about five miles from the start, was quite dry; as also were several unbridged tributary streams some miles further on. The mighty Jumna, running clear, and somewhat low in spite of the melting of the snows, was crossed at about twenty-nine miles. In years of exceptional rainfall the river comes down in an immense flood and the substantial iron bridge was swept away in the year 1924. Soon after leaving the banks of the river begins the gradual ascent by the well-constructed military road, which, first winding through tropical forests and later making its serpentine way along bare and rocky hill sides, brings the traveller at the end of a journey of sixty miles to the military cantonment of Chakrata. Only five years previously (1915) this now comfortable journey by motor car was performed in jolting and nerve racking tongas, taking two full days to accomplish the distance, now covered in five hours. In spite of the elevation of nearly 7,000 feet the sun was hot at noon, when the motor arrived at 'Kailana Nek', but at sundown warm clothing was both welcome and necessary.

The day following was spent in sorting, packing, and making ready for the early despatch of baggage coolies the next morning. An excellent white hill pony, which had been arranged for, was tried and found to be sure-footed and the possessor of sound wind—both essentials for a hill pony. He was of the sturdy Rampur breed. The baggage coolies started off at seven o'clock and I followed them three hours later, riding as far as the Forest Department 'wood-shoot'—by which timber cut for firewood is sent hurtling down the mountain side for some hundreds of feet,—and doing the remainder of the march on foot. The road, a well-constructed riding path some six feet in width, winds along a high ridge; and passing sometimes south and sometimes north. It affords alternate far-reaching views down the steep and wooded hill sides over the valleys of the Tons and Jumna rivers. All along the path were banks of wild violets, and in favourable places a quantity of many coloured wild flowers could be seen. Banks of Maidenhair and other ferns were in profusion. Snow was still lying in sheltered spots; and where the path wound through forests of fir trees such as morinda, kail, spruce, and deodar, it was quite cold, and sunny spaces were welcome. The air was crisp and clear: a change indeed from the dreariness and dust of the shimmering plains, now dimly visible in the far distance and soon to be but as an ugly dream!

At about the eighth mile along the ridges, the path passing along the southern slopes of the Peak of Karamba (10,025′) crosses over to the north side, and a climb of a few hundred feet above the road at this point afforded a magnificent view of hundreds of miles of snowy ranges, 'the stainless ramps of huge Himâla's wall', extending from Nanda Devi and Trisul far away in Eastern Kumaon, both of which could be seen, to the mountains of Spiti and Kulu to the north. Far away on the horizon was one massive snowy mountain which must be a giant of the Himalayas as it was visible in solitary grandeur after the other peaks had disappeared from view. The northern slopes of Karamba were covered with extensive patches of snow, and for the last three miles, all down hill, to the Forest Department Rest House at Mundali, there were banks of snow in sheltered places.

It was close to this Rest House that a famous man-eating tigress was killed I think in the year 1887, after having terrorized the country side for some thirteen years. The manner of her death was an exciting and dramatic episode. The story is related in an early number of the *Journal of the Bombay Natural History Society*.

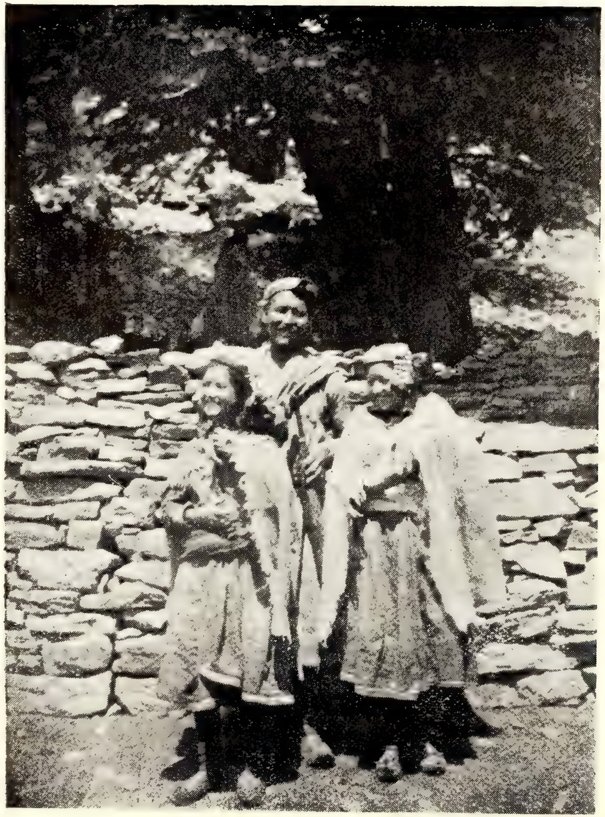
On the morning of April 30th a start was made by seven o'clock. The first three miles was a short cut which saved some miles of travel by the upper contour path. There was then a gradual ascent of three miles to Kathyan, where is another Forest Rest House

Three Months up the Valley of the Sutlej

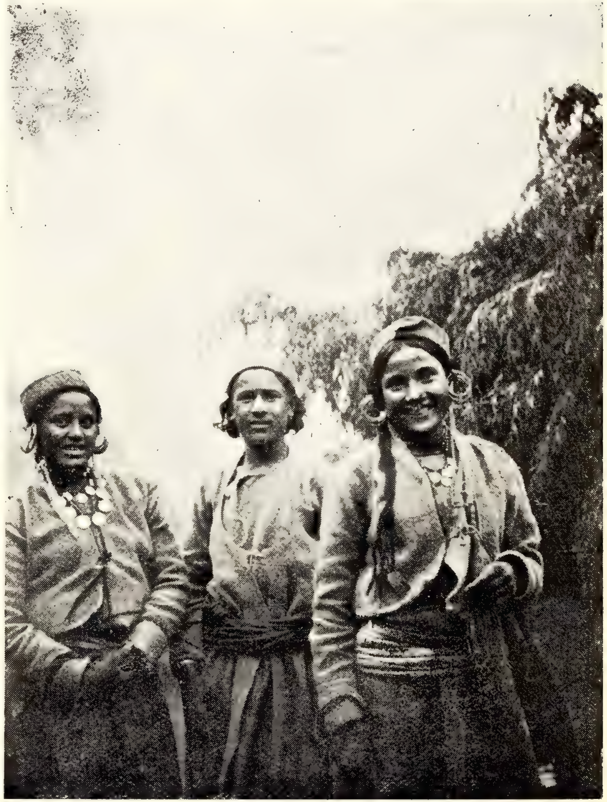
Imposing edifice at Fort Samarkot

A temple at Soondri

THREE MONTHS UP THE VALLEY OF THE SUTLEJ RIVER



TWO TIBETAN DAMSELS.
Servants of a Missionary Lady



TWO OF MY BAGGAGE CARRYING DAMSELS AND A LAD OF TARANDA charmingly situated in a fir wood; and from thence, after some five or six miles of level going, the path descends steeply to the Forest Rest House of Tewni which is situated at an elevation of only 3,000 feet. The whole of this march, after passing Kathyan, is along a ridge and down the main spur of it. The main bridle path is a good deal longer and winds down the valley to east of the ridge. The walk from Mundali was an easy and pleasant one in spite of the distance being some fourteen miles. I walked most of the way but was tired, being out of condition, and felt as if I could never climb a hill or summon up energy to pursue the finest ibex in Asia!

It was pleasant to be greeted on arrival at Tewni by a Siana (headman of villages) with a gift of a freshly caught fish and a jar of honey; and it was also gratifying to know that the people of these hills were not unmindful of all the work undertaken in their interests during the three years this sub-division was in my charge. The Tons river, a snow-fed torrent, was roaring down as of old, its waters reflecting the same beautiful play of colours; dark blue, light blue, dark and light green, topaz in its many hues, and creamy white; dashing and splashing and roaring along. It lulled me to sleep while waiting for coolies to arrive and again after dinner. Until my return some three months later I was but seldom out of the sound of running water.

Arakot Forest Rest House, situated eight miles from Tewni and on the right bank of the Pabar river, was reached at one o'clock next day. The path followed the river all the way. Wild roses were in abundance, and the lovely crimson petals of a variety of *Erythrina* lent vivid splashes of colour to the scenery. It was good to see old haunts. The place where H attempted to shoot an otter; the precipice where he and I jointly encompassed the death of a fine old tahr; the various places along the road all the way from Chakrata, where halts for long past breakfasts had been made; the familiar faces of village people—some of them litigants in revenue and other cases—; all these were vivid reminders of the three years so happily passed in these beautiful hills.

An entry in the Arakot Bungalow visitors' book showed that my last stay there was on November 5, 1916. Two subsequent entries afforded amusement. Mr. and Mrs. . . . . and party, of Bombay, remark under date October 23, 1917, 'Lovely spot, *hope to visit it again some day.*' The entry following this is by the Forest Officer, who wrote on November 23, underlining as above, 'If so I hope the iron sheet out of the hot case, taken away as a souvenir, will be brought back'!

The next day's march of about eight miles was also along the banks of the river, and the going easy. My feet were now less apparent to my senses and I felt much more like hunting the wary ibex. In such a climate, and leading such a life, one soon gets into condition. The pony—'Motee' was his name—led behind me all the many hundred miles of this trip, was in consequence somewhat shortwinded on his return to Chakrata. It was, however, a comforting feeling to know that he was at hand should at any time the flesh become weaker than the spirit.

There is no Rest House at Hatkoti, but, it being Sunday and the scholars away, accommodation was obtained in the school building. Hatkoti to Roru is seven miles. The river bed is more level and the valley wider. About a mile from Hatkoti there are twelve ancient temples built of large hewn stone slabs surmounted at the top by a circular stone carved in the form of a lotus plant. 'Built by the Gods,' the local people reply when questioned regarding them. They date from about the year A.D. 700 and precisely similar structures are to be seen in other parts of these hills; also about Dwarahat in the Kumaon hills north of Ranikhet, and at Badri in Garhwal.

Along the river bank on this day's march, where many sweet scented flowering shrubs and dog-roses still pleased the eye, I carried with me a bunch of lovely deep red roses of most beautiful fragrance, gathered from a gorgeous profusion growing on the walls near the Hatkoti school. Each of the baggage coolies had a rose stuck in his cap. A shade of green was appearing on the slopes of the hills but they were practically bare of trees. Scarcely a tree was to be seen at Hatkoti. As one gets away from Jaunsar-Bawar and the influence of the Forest Department the deforestation of the hillsides is very noticeable.

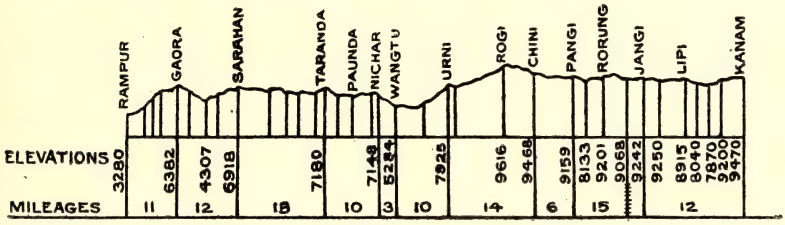
Roru is in Bashahr, and here is the Tahsil for the southern portion of that State. The jurisdiction of the Tashil of Chini meets that of Roru at a place called Wangtu a few miles beyond Nichar. In the village of Roru is a post office, also several shops whence all ordinary supplies can be obtained. The Forest Rest House is well situated, giving a view of the Pabar Valley to the snowy mountains among which the river has its source.

The distance from Roru to Soongri—a dâk bungalow on the Hindustan-Tibet road—is fourteen miles. Almost every foot of the way is up hill, the last eight miles being very steep, and the last five a mere stair case. The rise in elevation is over 5,000 feet. I walked the whole distance and after having tea on arrival felt quite all right. The coolies started at six o'clock and got in at four in the afternoon. For the first six miles there was but little shade, then the path went through alternate deodar plantations and cultivated land. There was plenty of water and the country was well wooded. At six miles from Roru the road forks, the main path leading to Kadrala. This wide spreading valley is a noted place for black bear in the autumn months; at the head of it is a dâk bungalow on the Simla road.

Four photographs were taken on this march, the first being that of some shepherds returning with their sheep and goats to the upland grazing grounds after having passed the winter months in the pastures of the lower valleys. The lady of the party would not at first show her face: but afterwards, quite realizing that her picture was to be taken, put forefinger on chin and gazed at the sky! The dogs with these people were nice and friendly, wagging their tails and allowing their heads to be patted. So different to the dogs of the plains of India, as indeed are most hill people also. On the ruins of an old Fort called Samerkot, situated a few miles below Soongri, is a very imposing edifice which afforded a suitable subject for a photograph. It was said to be one of the residences of the Rajah of Bashahr. A group of some villagers of Khanda and of the houses, to show the style of architecture, were both satisfactory pictures.

Having now come seventy-two miles, a day's halt was made. The Soongri bungalow is at an elevation of 8,750′ and is sixty-six miles from Simla. The temperature at 10 a.m. on May 5, was 57° and was not much above 60° at any time during the day. To the south-east is the massive hump of a hill called Marrarle (12,258′) at that time covered with snow to within about two thousand feet, of the summit. There is a path leading up to it; and going along this for about six miles, almost all the way through fragrant forests of fir, I got to within about the same distance of the top of the hill. All about Soongri violets and flowers of many kinds were in great profusion, and from now onwards the wild flowers and flowering creepers were a source of the greatest pleasure, which would have been much enhanced by a working knowledge of botany had I possessed it. A copy of that well-known work *Flora Simlensis* should be taken with one, when journeying in those hills.

A section of the Hindustan—Tibet Road will here be of interest to the reader. The Simla-Soongri branch of it joins the Rampur branch at Sarahan. The road bifurcates at Narkanda, the fourth stage from Simla, the Soongri-Dharangati portion being the main road as originally designed.



SECTION OF HINDUSTAN-TIBET ROAD

From Soongri to Bahli, the next Bungalow on the road, is twelve miles, but a short cut, very steep and rocky and strewn with pine needles, takes off some of this. It would be a bad path in wet weather. Most of the way was through cool forest of kail and deodar trees. Half-way down the hill the loud barking of a *kakur* or Barking Deer attracted attention. The noise came nearer and nearer down the hill, and soon appeared a wild looking man of Kunawar who was taking sheep back to their summer grazing lands. He was the '*Kakur*' and his imitation of the cry of the barking deer was, to my ear, absolutely accurate. I envied him this accomplishment, which could be put to such effective use in calling up the wily panther to an imaginary dinner! Vain efforts were made to acquire the trick of voice uttered with such ease and accuracy by this happy-looking son of the breezy upland country. He had acquired the art in order to frighten his sheep and keep them on the move. When crossing the ravine before commencing the ascent to gain the main road, the call of the common cuckoo was heard for the second time on this trip, the first occasion having been above Tewni on April 30. I have heard the call of this widely distributed bird during the month of April and May in the jungles of Hyderabad and the Central Provinces and also on the snowline in Kashmir and Kishtwar at an elevation of 10,000′ and more.

On arrival at Bahli Bungalow (8,200′) the cloudy sky and hazy atmosphere denied me the view of the mountains of Kulu and Spiti which would have otherwise been obtainable. The next day's march of eight miles to Taklech Forest Bungalow was shortened to five or six miles by use of a rocky goat track which descended steeply, for the most part through fields of terraced cultivation. The first four miles by the the main road had been through a forest of fir trees, and afforded pleasing views down the heavily wooded ravines. The sudden descent to the warm and sunny valley of Taklech, and the comparatively low elevation of 5,600 feet afforded a very sudden change in several ways. Up above all had been still and silent. Very few birds and butterflies had been seen. Below there was much bird life and the fields and hedgerows were enlivened by swarms of butterflies of brilliant hues. Gooral were to be found near the bungalow; but news of tahr some twelve miles up the Darkari Valley induced me to make a three days' excursion in that direction.

An early start on May 8, took me the eight miles to Darkari village in good time; and, having halted an hour or so for breakfast and to allow the baggage coolies to come up, the ridge some 1,200′ higher was soon gained. Two *shikaris* were supplied at short notice by the Lambardar, and in the evening we saw three female tahr on the face of a precipice in the further valley. Having dined off army ration, stewed figs, and *chupattis*, sleep under an overhanging ledge of rock was not long in coming.

At daybreak next morning the baggage was taken by four lightly-laden coolies to another camping place from which there was said to be more likelihood of the animals we were in search of being found. Nothing was seen, and I soon realized that the proper tahr ground at this season was much further on, up the precipitous slopes of Marrarle Hill, and that I could not afford the time to go in search of them. A heavy thunderstorm came on but cleared late in the afternoon. Fears of further bad weather during the night proved well founded. Rain early in the evening quickly changed to snow and this, with a rapidly falling temperature, kept up until about four in the morning.

I was lulled to sleep by the ' strong hum of forest tree tops ' but woke during the night very thirsty as the sausages for dinner were uncommonly salt. Having emptied the water bottle I was glad to eat some snow off the kit bag which protected my feet. One of the *shikaris* was under the rock near me and groaned and grunted all night, poor fellow, in a most distressing manner. The four coolies were jolly as crickets. They had no bedding, and just stuck it out round a fire under the wide-spreading branches of a deodar tree. Whenever I woke up they could be heard laughing and cracking jokes. Indeed these hill men are much to be admired for their endurance and bright and merry dispositions. It is difficult to imagine more depressing circumstances than the spending of a night in a gloomy forest in a snow and rain storm at an elevation of near 11,000′ : yet those gay lads laughed hilariously throughout the night. One merry fellow told me in the morning, with a happy smile that they had not slept a wink ! A smile in return, and the present of a rupee to each of them, sent them dancing off down the hill to Darkari with my kit. A further search for tahr proving fruitless, a return was made and Taklech reached by the evening, the last six miles having been somewhat painful owing to rheumatism in the left knee. I think that *shikaris* Behari and Kannu of Darkari would probably show good sport in October.

The road from Taklech to Darangati Forest Bungalow—about twelve miles—is mostly up hill, the elevation of the latter being 9,550′. As one tops the col the bungalow is seen on the east side of the ridge, and there is a most glorious panorama of snows, far and near. The heavy storm of the past two nights had brought the snow line quite low down. Twelve miles up the ridge to the east are mountains of 17,000′ and more : but the summits of these were not visible as the sky was stormy in every direction. Standing in the verandah of the picturesque bungalow one's gaze travels along the thickly wooded hills to the right, up to the now clouded peaks of the perpetual snows, down the ridge on the far side of the valley—now under a white mantle but doubtless bare of all that in a week's time—and then down and down to the gloomy gorges of the Sutlej River. Travelling beyond, the eye lifts to the stupendous snowy peaks of the wholly mountainous country of Spiti. The prospect terrified my two Chakrata coolies who had up to now only seen the perpetual snows at a distance of some fifty miles and more. Temperatures in the verandah were 45° at sun down and 40° at five in the morning.

During the mostly downhill walk of fourteen miles to Sarahan there was slight rain now and again. The road descending to 6,200′ passes over a deep ravine ; thence it rises by easy gradients to the bungalow (P.W.D.) which is situated at an elevation of 6,918′, on an open hill-side, high up above the bed of the Sutlej River a bend of which can be seen as a turbid flood far down in the rocky gorge.

Sarahan is the ancient capital of Bashahr State and the palace here—the present summer residence of the Rajah—is far superior to that at Rampur. It is built of rubble masonry, alternating with beams of cedar wood, and is of considerable age. The roofs are slanting and slightly concave like those of the Chinese. Connected with the palace is an ancient Kali temple at which in former days human sacrifices were probably offered.

Now that the more frequented portion of the Hindustan-Tibet Road was reached there was more traffic, and many strange looking people were to be seen passing along on their return to the higher country, some of them being bound for the Shipki pass and the wilds of Tibet. Owing to the traffic on the road and the day being clear and sunny, the march of fifteen miles to Taranda Bungalow (P.W.D.) did not seem so long as that of the previous day. Several photographs were taken, including that of two of my own baggage-carrying damsels and a lad of Taranda. Such merry happy faces. Much of the carrying along this road was done by women, young and old. A lad of about fifteen carried a load of sixty pounds the whole of this long march and smiled merrily at the end of it! Wonderful people.

The women were very pleasant to deal with and never grumbled. The reason for most of the baggage-carrying work being done by women appears to have been that in those mountain valleys the cooly caste is not very numerous, and for this reason those of good caste had to perform their share of this forced labour. As the male population consider it humiliating they make the womenfolk do it, not seeing that by this arrangement they disgraced themselves the more. The forced system of '*begar*' has now been abolished—much to the inconvenience of Europeans travelling in the hills—and journeying in this and some other parts of the Himalayas has, in consequence, become difficult; also exceedingly expensive.

On this day I met the Conservator of Forests and learned that my shooting pass was on its way to me, the number of each description of animal being limited to one ibex, one snow bear, three tahr, three gooral, two serow, and three burhel. If a snow bear should be notified as a sheep killer then another might be shot. These numbers were the limit for a month or a year. I was fated to see only the first and the last of the list.

Almost at the moment of my meeting with the Forest Department party an accident had happened to the cooly entrusted with the departmental medicine chest. He had sat heavily on the road parapet, with his back to the steep hillside, and this giving way he and his load went clattering down the precipitous declivity. He looked as if he needed some of the few remaining contents of the much damaged stock of medicines.

There have been casualties to Europeans on this well-known route during the past sixty years, but not many, considering the number who must have travelled along it.

Mile 15 Mr. Cockerell killed with his horse, 1873.
,, 26, Mrs. Brind, horse, and syce, killed, 1865.
,, 95* Sir A. Lawrence killed, riding, 1864.
,, 101, Mrs. Leathes and horse killed, 1890.
,, 117, Miss Rebsch killed when with Mr. Paul.

The bungalow at Taranda is amongst fir trees and faces the valley, from the depths of which the roar of the river can be faintly heard. On the far side, rising steeply from the river bed, is a hill of some 12,000′, snow covered at that time; and towering beyond is a peak 18,446′ in height. The scenery is grand, and built by nature on a lavish scale.

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* Miles 95 and 101 are between Sarahan and Taranda.

At the fourth mile on the way to Nichar is the P. W. D. Bungalow of Paunda where it is customary to change the baggage coolies and is convenient to stop for breakfast. After passing Paunda the road winds through some splendid deodars. Below the road, near the village of Sungri, is a picturesque temple of which, in common no doubt with many other travellers, an excellent photograph was secured. It is an ancient wooden Mahesvara temple and a fine specimen of hill architecture. It has a square ground plan and three slanting roofs, one above the other, the lower one being the largest and the top one the smallest of the three. While the two lower ones are square the top one is round, shaped like a funnel. The four corner beams of the lowest roof end in wooden figures of walking lions of almost life-like size. The temple contains a *lingam*. On the road from Sungri to Nichar is seen the first Lamaist *Stupa*. It is small, only about six feet high.

It is very pleasant marching along this road: one constantly passes herds of sheep and goats migrating to the hills after spending the winter months in the lower valleys. Many baby kids and lambs frisk along with the slowly moving party. With the flocks are the shepherds and their families, accompanied by one or more shaggy dogs of large size and mostly good tempered with strangers. They are very fierce when guarding the flocks by night. The children are bright and happy-looking with rosy, if somewhat grubby, cheeks, the mothers being highly delighted when notice is taken of them.

At Nichar Post Office a budget of letters and newspapers was retrieved and the building photographed. The descent to Wanghtu Bungalow some three miles further on is steep, and a terrific wind, of the biting and penetrating variety was howling, down the narrow gorge of the river reminding me of the Tons Valley in December. The shelter of the bungalow, and comfort of a blazing wood fire, was very welcome. That day was the last of the great storm which had swept over the Himalayas for many hundreds of miles.

Crossing the river by a modern suspension bridge 150 feet in length, the Tibet road follows the right bank of the river and is more or less level for the first six or seven miles. Opposite the bridge is a track which leads into the Bhabeh nullah—said to be good for snow bear—and then, by a pass at the head of the valley, into Spiti. This is the route to Hanle and Ladak by way of the formidable Parang La, a pass 18,300′ high and much dreaded by all who have to make their way across it. Wangtu is a place so obviously suitable for a bridge that there has probably been one here from time immemorial, as is further indicated by ancient carvings on the rocks. In the rocks are many smoke-begrimed caves used by travellers, and about the caves and rocks are numerous Tibetan inscriptions in charcoal and red chalk.

There was a wooden bridge here in 1817 but this was destroyed by the Gurkhas in 1819 and afterwards replaced by a rope bridge. This bridge marks the ancient boundary between Bashahr and Tibet. Even to this day Tibetan influence makes itself felt in the frequency among the people of personal Tibetan names. From here onwards the Pahari dialects of the lower Sutlej valley are replaced by the Kunawari language. The grammar of this language of Kunawar is said to have close affinity to that of Mundaie, a language of Chota Nagpur, and to indicate that in very early times an amalgamation must have taken place between Munda aboriginal tribes and Tibetans! Should my wanderings ever take me to Chota Nagpur I will try and observe any indications of the Mongolian strain.

Five miles short of Urni, the next bungalow to be come to, a chaprassi from the Chini Tahsil met me with a change of coolies. He was also the bearer of a note from the Tahsildar to say that a *shikari* had been arranged for at Pangi on May 17, and that the chaprassi was attached to my camp for the duration of my stay in that country. From the river-bed the road winds zig-zag fashion up the steep hillside. The road in several places overhangs the precipitous slopes, being supported by means of buttressed planks. It was along this stretch of road that Miss Rebsch was killed some years before. From Urni, looking across the river, the village of Kilba could be seen. Here there is a dispensary, and, I think, a post office also.

The old temple at Urni, in which worship is no longer performed, is of the square tower type and has a wooden verandah running round below the standing gable roof. There is a new temple, not far from the old one, at which are many wood carvings of a primitive kind, one of which represents a man shooting a leopard with a gun. The slanting gable beams of the temple had representations of walking lions like those at Sungra. Most of the roofs at Urni village are of the flat Tibetan style.

The country called the 'dry zone' had now been entered. Beyond Wangtu there is but little rain, the several ranges of mountains holding back the surcharged clouds of the monsoons of India and causing them to discharge their torrential rain against the western slopes. Any rains which reach the valley are only in the shape of English April showers—falling gently and at intervals. The hillsides were less heavily wooded and it was generally apparent that climatic conditions were different to those of the valleys through which we had come. The air was perfumed by the scent of many aromatic shrubs and grasses.

The following day's march of fourteen miles to Chini was a fairly easy one as to gradients. Owing to the recent storms the snow line was lower than usual and the scenery was magnificent. In one place the road had slipped into the Sutlej several thousand feet below. For a considerable distance the road has been blasted out of the solid rock giving a dizzy prospect as one looks over the railings into the stupendous gorge of the river. This was between Rogi and Chini, the former being a P.W.D. Bungalow.

An extract from a letter written by Lord Dalhousie from Chini on June 30, 1850, will here be of interest as describing this portion of the 'road' as it was at that time. It was on the initiative of this great Viceroy that the present graded road was commenced. It has not yet progressed beyond Kanam :—'We 'arrived here yesterday, after a fortnight's travel. The track, for 'it hardly could be caled a path, was desperate, and for women 'terrific. It is simply the native track, neither engineered nor 'formed. Flights of stairs formed of loose stones are the chief 'ascents, and sometimes stairs of trunks of trees. In rounding 'the corners of the precipices I have seen the track not three feet 'wide, and the Sutlej 3,000′ or so sheer below you! My Lady was 'carried in a thing they call a *dandy*, like a hammock slung on a 'single pole. It is carried on two men's shoulders, and long 'ropetraces are attached by which they pull you up the ascents where 'the zigzags are long enough to allow it, and lower you down the 'steep descents on the other side. Near to this place you cross a 'face of rock several hundred yards long, and as many high, by 'continuous flights of those steps, and rude wooden platforms 'supported on pegs of wood driven into the clefts of the cliffs. The 'descent is direct to the river, I should say nearly 5,000′ below! 'It was very grand but *really* funky.'

Leaving the Rogi cliffs the road makes a sharp inward turn, bringing into view the wide valley of Chini, which had then a somewhat wintry appearance but was soon to put on summer garb. The elevation is 9,486′ and the winter severe, but spring and autumn months provide a perfect climate. On either side of the valley the mountains rise to a height of over 20,000′, those on the south being close by and towering above the river bed.

There was formerly a Moravian mission established here the work of which was taken over by the Salvation Army. Now there is, I believe, no mission at Chini. Captain and Mrs. Mortimer were most kind and helpful in every way, telling me much of their life in this out of the way place among the simple hill people, and of the country and its inhabitants, also of the prospects of *shikar.* The skin of a half-grown snow leopard was shown to me. During the winter it was killing sheep up the hillside, not far behind the house, and the owner of the flock was on the look out for it. The son of the owner, quite a lad, came upon the marauder just after it had killed a sheep and was intent on its meal. He called his father and then, while the boy seized the leopard by the tail, the father blew the brute up with his gun. A splendid *tale*!

The town of Chini has a picturesque appearance, lying as it does on fairly level slopes of the widening valley, and overshadowed by the perpetual snows of Castle Rock, and other mighty peaks, towering to some 20,000′ but a few short miles away. The valley is well wooded, deodar and walnut trees being in abundance, the latter just then coming into leaf. In the month of August the whole valley is yellow with ripe apricots and at the same time the luxuriant vineyards near the river are producing the finest grapes of some eighteen varieties. The climate is well suited to fruit-growing and many imported varieties thrive well:—peaches, pears, plums, apricots, apples are all in abundance, as also all kinds of garden produce. An instance of this was the one gooseberry bush found by the Mortimers on arrival six years before. This bush had become some two hundred and more, the produce of which, sold in Simla, paid the wages of a mali for a whole year. The Tahsildar informed me that cabbages were grown weighing as much as 30 lbs.!

The building which is now the Tahsil was the residence of Lord and Lady Dalhousie when they resided at Chini from June to September in the year 1850. The change to this dry and bracing climate was urged upon them by their medical advisers and proved of the greatest benefit to their health.

The Forest Bungalow commands a magnificent panorama of the perpetual snows just across the valley. An early morning photograph, taken just as the sun was about to rise over the shoulder of the mountain, was quite successful. Later on, under the guidance of Captain Mortimer, a visit was made to the village of Koti, situated about 12,000′ below Chini and half way to the suspension bridge over the Sutlej River. There the difference in temperature and state of the crops and foliage was very marked. Walnut trees were in full leaf, while those at Chini were in bud only. A fine deodar tree was measured and found to be 31 feet in girth breast high from the ground. At Pangi a tree with a larger girth—32 feet 6 inches,—was seen, but it was not so well grown. Lord Dalhousie records one which measured 36 feet in circumference. The edible pine—*Cidrus gerardiana*—was common. The people have the right to the fruit of all such trees whether they grow in or out of the forests controlled by the Forest Department.

At Koti we found daily worship in progress at the main temple. Inside the building were two figures in *dandies.* One was the goddess and the other her servant. These figures were danced up and down by men holding the poles and then a priest read out the oracle for the day. Close by was another building with a small water cistern inside it. The fish—barbel—ran up to about two pounds in weight and seemed pleased with the broken biscuit thrown to them. A woman, energetically occupied in stamping on and kneading homespun cloth in a stream of water afforded a good subject for a photograph. Many of the women of this country are very good looking; others, mostly of lower castes no doubt, are somewhat ugly and of quite a different type.

While at Chini warm clothing, necessary for my servant and two Chakrata coolies, was made up by a local tailor from homespun cloth purchased in a neighbouring village. The cost was reasonable and the articles suited to the climate. A large blanket of pure wool, purchased for myself from the Salvation Army Weaving Establishment for nine rupees, has been in constant use until now and will be serviceable for a number of years.

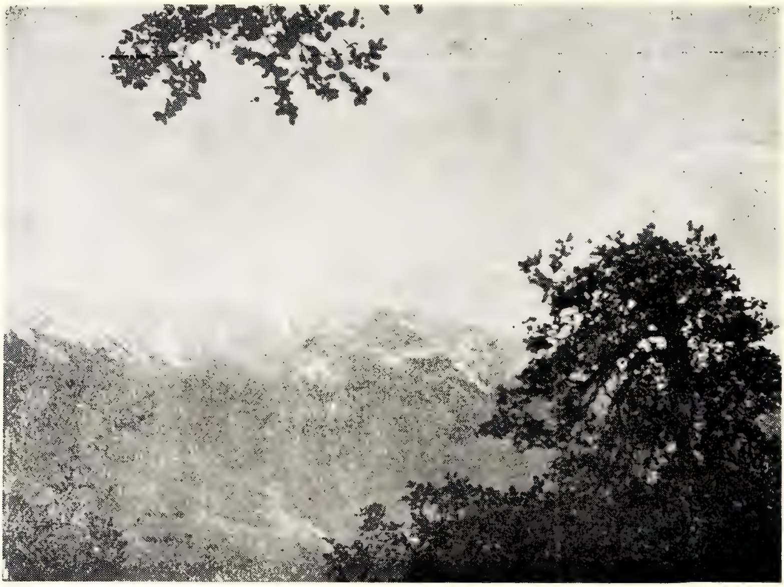
On May 20 a pleasant walk of six miles took me to Pangi. Some little distance from Chini, below the road, is a house said to have been that of a European—the first to live in these hills—who had established himself here very many years ago. I did not know of this at the time so am unable to describe it. The P.W.D. Bungalow at Pangi is a large one, situated well above the road, and commanding a fine view of the valley, with a different aspect of the snows

THREE MONTHS UP THE VALLEY OF THE SUTLEJ

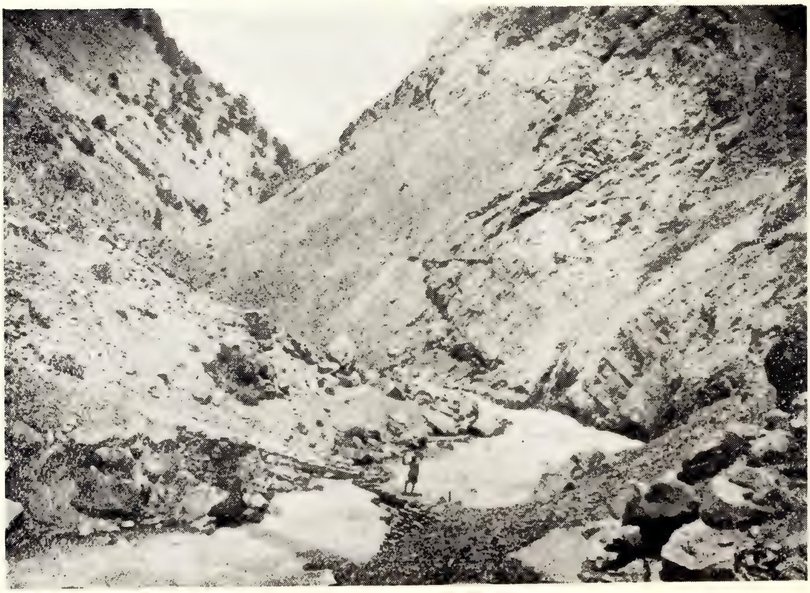
PANORAMA FROM CHINI FOREST

VIEW FROM CHINI FOREST BUNGALOW

THREE MONTHS UP THE VALLEY OF THE SUTLEJ



VIEW FROM SNOW STORM CAMP



THE THAMAN RIVER AT RUPA

beyond. The bungalow was built about sixty-five years ago. In the verandah is a large table of deodar wood almost completely covered with the names of travellers, some of them known to fame, who have passed that way. The oldest names are those of two officers of the 4th Hussars—September 1870. Future travellers will have to carve their illustrious names or initials on the other similar table which is to be found in the bungalow. Near the village is a lamaist gateway built across the road. Several others of the kind were met with further on. They all have a *stupa* on the roof and frescoes on the ceilings.

The local *shikari* had been to Chini on the 17th to see me and been sent out with field glasses to search the Kashang Gad (*nullah*) for game. He returned the evening of my arrival to say that nothing had been seen, and that, owing to the lateness of the spring there was yet no grass and no game to be found. This was unfortunate as this *nullah* had quite a reputation for snow bear and burhel. So my hopes of early success were doomed to disappointment. A day's halt for the *shikari* to prospect up another valley near by proved barren of results. There was nothing to be done but take the road for Jangi and the Ashang Gad, at entrance of which is the village of Lipi.

This march of fifteen miles was long and tiring, or a wind stroke in my back made it feel so. At Rorung a change of coolies was made. The road was broken in many places. It was a marvel to see ' Motu ' cross like a skipping goat over the most impassible looking rocks. There were some fine precipices on the way, and at one place there had been a great disintegration from the heights above, probably some fifty years previously, as could be seen by the immense number of huge rocks and boulders strewn over the slopes of the hill. The last two miles into Jangi afforded a marked change of scenery. Fine deodar trees amidst deep mould, and a broadening valley. Beyond Jangi could be seen almost bare hillsides, those facing the west being wholly devoid of trees. Most of the trees seen are those known as the Pencil Cedar—a kind of juniper. Opposite Jangi lies the village of Kinam, with a fine castle on a rock above the river. It was said to have been built by the Rajah of Bashahr.

News from the Ashang Gad was not encouraging. Without a visit, which time did not permit, it was not possible to know if information was correct or designed to move me further on.

I had now been twenty-six days on the road and no game in sight, so a letter was despatched to India asking for a month's extension of leave. My plans were made to bring me back to Jangi in time to meet the reply to my letter so that I would be able to act as seemed best for the days remaining to me.

Leaving Jangi bungalow on May 23, we set out for Rupa, the highest village in the valley of the Thanim River, my enquiries from goatherds passing along the road pointing to there being a certainty of finding game in that direction. The stage to Kanam was twelve miles and the road became worse and worse. Tibetan Mani walls were now frequently met with. They were strewn with stone and slate tablets bearing the words *Oṁ Mani Padme Hūṁ.* There was no bungalow at the scattered and very picturesque village of Kanam. On the hill is to be seen the first monastery of this part of the country. The Hungarian scientist, Cosma de Körös, the pioneer in the Study of Tibetan languages, lived here during the years 1827 to 1830, and was visited by the traveller Dr. Gerard in 1829.

The mist and cloud effects that day, with visions of the higher snows in between the rifts, were very fine. It took eight hours to do the thirteen miles to Shiasu, the Thanim River, a tributary of the Sutlej, being crossed a mile short of the village by a substantial iron girder bridge. In many places the track was only fit for goats. The wonderful pony got over the bad places in an extraordinary way. A drove of ponies was seen on the hillside near Kanam. One of them had been attacked in the autumn of the previous year by a bear. His withers, which had been badly bitten, were still swollen and running with matter. The descent to the Thanim bridge was along the face of an immense precipice. Contemplating the bridge one could well realize the difficulties which had been overcome in transporting such heavy materials by cooly labour 180 miles from Simla.

Heavy clouds could be seen banked up behind the mountainous barrier which holds back the monsoon from this almost rainless country. The unpleasant weather which must then have prevailed on the western slopes of the Himalayas could be readily imagined. Having crossed the iron bridge, the path to Shipki and Tibet winds up the mountain side to follow the valley of the Sutlej River, now a daily increasing tumultuous torrent of icy water of a reddish colour. Our way led us a mile up the left bank of the Thanim River to the small village of Shiasu which faces tremendous precipices. Here direct postal arrangements had to cease as I could no longer receive letters from the mail runners. It was possible however to arrange for post being sent up the valley to my camp as occasion offered.

The ten miles' journey next day took us to camp at Chamong, also called Giāban. Just as we left Shiasu tremendous reverberations were heard and masses of the precipice were seen to be falling into the river-bed. The path was fairly level all the way. A colossal snow bridge, caused by an avalanche from the heights above, was seen to be blocking the river. After leaving the large village of Suinam we crossed and recrossed the many shallow streams into which the river had been diverted on its way through the new level valley.

Some of the women now met with had a distinctly Mongolian type of face, indicating the mingling of the inhabitants with the neighbouring people of Tibet. Many earrings are worn—in one instance eleven were counted on either side—but attached to the hair above the ears, and not to the ears themselves, an arrangement which commended itself to me as eminently sensible. The earrings are strung on a piece of plaited wool and this is fastened to the hair. Scattered about the wide and spreading bed of the river were fields of cultivation. There were many deodar and edible pine trees, all of crooked and stunted growth, indicating the tremendous snowfall and long rigorous winter to which they are subjected.

Having now got off the beaten track, the willingness of the villagers to give information as to game became pleasingly apparent; so the next day's move of seven miles to Rupa was made in a more hopeful spirit. Shortly after leaving Châmōng a tributary stream was crossed. This afforded a very clear illustration on a small scale, of how these Himalayan mountain streams and rivers silt up their beds, become blocked, and cut new channels for themselves through the masses of rocks and shingle brought down from above.

In Rupa village deep banks of snow were still to be seen along the lanes and between the houses. The snowline was about 1,000′ above the bed of the river.

In Rupa was a *shikari*, Ramdass by name, rather old and beyond work. He arranged however to accompany my camp and to provide two able young men to do the *shikar* work. This settled, he promptly extracted two rupees from me for the village deity. Having on the way up from Châmiōng fired half a dozen practice shots with the ·280 Ross rifle, which had been borrowed from a friend as a second weapon in case of any accident to my ·375 an old and trusted friend—the opportunity to give the men confidence as to likelihood of animals being slain when seen seemed a good one. The mark, a small stone some 300 yards away across the river, was fortunately struck by the bullet amidst the astonished exclamations of the assembled villagers. We then proceeded to the camping ground which was in a level field near the bank of the river about a mile further on.

On May 27, the *shikaris* having got outside an enormous heap of *chupattis* to which quite possibly my two rupees had something to say—an early start was made. A long steady climb took us by nine o'clock to the top of the side valley in which it had been said that ibex might perhaps be seen. Tracks in the snow were observed, but careful search with field glasses and telescope failed to disclose any animals. The ibex had evidently moved further up the main valley. Crossing over to the southern side of the main ridge three lots of female burhel were descried, but no rams were to be found. These animals were not in the least shy. Camp was reached at 2 p.m., the thermometer showed the temperature to be 55°. The day before something had made me suspect that this excursion up the hill was mainly to discover how I could get over the ground, a natural enough desire as it is not usual for these people to see a sportsman with the obivously game leg with which I am afflicted. My suspicions were confirmed, as old Ramdass spoke to the two men who were with me in their own dialect, and quite frankly admitted on my questioning him that they wanted to find out how much hill climbing I would be able to do. From the top of the hill we had surmounted, nothing but snow was to be seen in many directions. The thermometer showed 7° at 4.30 a.m.

Bad weather during the night brought the snow line a thousand feet lower and, though this soon disappeared, camp could not be moved because of the danger from falling stones. A flock of about 200 blue rock pigeons, the smaller hill variety, flew about the fields, evidently driven by the inclement weather to the comparative shelter of the valley. They were extremely wary and would not allow me within shot. Dotted about the terraced fields were many apricot trees just coming into blossom, the lovely pale pink being very pleasing to the eye. Some tiny pink flowers were struggling to appear—heralds of the many beautiful varieties which would soon be seen. The season was about three weeks late, all the better for *shikar* now I was on the ground, and the 'oldest inhabitants' said, as they always do, that there had been no such weather within their recollection. A sheep, weight 50 lbs., was purchased for six rupees, two fowls at ten annas each, and eggs at twelve annas a dozen. Between Kanam and Suinam many chukor had been seen, and a few were now flushed in the fields about the camp.

Next day, the 29th, camp was moved about seven miles up river. About one and a half miles after the start a number of ibex—thirty were counted—were seen to be making their way towards the higher country. All were females and quite small males. They were, at one time, only some 200 yards distant. The weather seemed now to have made a definite change and it was much warmer. The river was rapid, roaring turbulently from under the several snow bridges which had to be crossed. As we progressed the snow bridge became almost continuous, but it was not safe to trust to it and goat paths along the hillside had to be followed. The ibex came along, more or less level, for a long distance, and then disappeared from view among the rugged ravines.

On the opposite side of the river, about three hundred yards up the hill, and near a shale slope some sixty yards in width, a female ibex was standing, seemingly carved in stone, a vigilant sentry on behalf of the herd on the reverse side of the spur. This shale slope was pointed out as the place where, a few days before, a man from Rupa had been found dead. He had gone out alone, and been killed by a stone hurtling from the heights above. It was after several days' search that he was found. Within a few minutes we were to have realistic demonstration as to how death had called him. The sun was now well up and old Ramdass advised no delay. Turning a bend in the river it was seen that a similar shale slope to that we had just looked upon had to be crossed. About half our party had got to the other side and I was some way across, the tiffin cooly with basket on his back a few paces behind, when a warning shout was heard. Looking up, the dust was seen flying in half a dozen places not far from the sky line some two thousand feet above. Then appeared the boulders, black specs against the blue, bounding down with leaps of hundreds of yards at a time. Almost immediately they were upon us, big as a man's head and whizzing past with dreadful force and velocity. One could but keep quiet, lying face up hill to afford as small a mark as possible, but ready to endeavour to shift a bit to one side or the other. That is what I did, but the cooly remained standing. The first few stones spared us. Then there was a crash and down went the cooly, basket and all, hurled fifty feet by the impact of a rugged rock. I was hastening to him when he picked himself up and we both went on as fast as we could, to be again halted by a further discharge of aerial artillery, but to reach the further side in safety. The snow was now melting fast and stones came down at more frequent intervals. All the baggage coolies, with exception of one woman, had crossed in safety. She wrung her hands, quite unnerved, so one of the men volunteering for the job, went across and brought over the load, receiving on the spot extra payment for so doing.

Camp was soon reached, a site for the tents being selected under a great overhanging rock opposite where the Pamachang tributary falls into the main river. The down country servant and Chakrata coolies were very apprehensive as to the immense rock balanced above their heads. I think they were not happy in their minds until we left this camp, overshadowed by the mighty mass of stone which certainly had the appearance of requiring but little provocation to descend upon us. The damage to the contents of the lunch basket was found to be considerable. Precious glass bottles broken and contents all mixed together. The cooly had a fortunate escape. His back was half turned towards the hill and the stone caught the left-hand upper corner of the basket.

At last a shooting camp had been attained and hopes were bright for the next day. Behind, almost overhanging the camp, reared up a high, savage range of limestone and granite. In front of the camp was a roaring torrent fed by the melting snows from the mountains dividing Kunawar from Spiti; to the north a precipitous mountain its crests serrated in rising and falling outlines, trimmed with radiating buttresses, spired peaks, and bands of snow. The scrub covered slopes were dotted with many rocks and boulders fallen from the heights above. The evening light glowed in the sky as we settled down for the night, and luminous banks of burning crimson clouds hung over the summits of the snow topmost mountains.

(*To be continued*)

BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA, BURMA AND CEYLON

Report No. 38 Sind

By Mrs. Helen M. Lindsay

Collection	No. 38.
Locality	Indus Delta, Sind.
Date	October to December, 1922.
Collected by	C. McCann.

This collection consists of 120 specimens, representing sixteen genera. It was made in a small area east of Karachi, lying round the lowest reaches of the Indus River, considerably south of the tract of country visited by Mr. Prater in 1915. The genera represented in this area of Lower Sind are identical with those brought by Mr. Prater from Upper Sind, save in two instances, viz. *Leggadilla* and *Asellia*. No detailed description is therefore necessary, for Mr. Wroughton has dealt fully with all the specimens from Upper Sind in vol. xxiv, No. 4 of the *Journal of the Natural History Society, 1916*.

The specimens were obtained from

1. Tatta on the Indus, sixty miles east of Karachi.
2. Gharo, a flat sandy place.
3. Mirpur Sakro, fifteen miles south of Gharo, cultivated and marshy.
4. Gholam.
5. Bohara.
6. Ketti.
7. Bagar.

These are all villages lying south-west of Tatta and more towards the mouths of the Indus.

(1) Asellia tridens murraiana, K. And.

The Sind Trident Leaf-nosed Bat.

(Synonymy in No. 32.)

This genus is not represented in the collection from Upper Sind. From Panjgur, Baluchistan, twenty-two specimens were brought by Col. J. C. B. Hotson and recorded in Report No. 32 by the late Mr. Wroughton, but these are all smaller in size and lighter in colour than those from Lower Sind. The fore arm of the former measures 42 mm. while that of the latter is 54 mm. The skulls, however, are identical in formation with those of young age in the Baluchistan collection. It would be interesting to see more specimens of this genus from the same locality.

Tatta, ♂ 2.

(2) Hipposideros fulvus pallidus, K. And.

The Sind or Pale Bicoloured Leaf-nosed Bat.

(Synonymy in No. 3.)

Gholam, ♂ 2, ♀ 12, Gharo, ♂ 1, ♀ 1, Tatta ♀ 1 (in alcohol 1.)

(3) Pipistrellus kuhli lepidus, Bl.

The Pale White-bordered Bat.

(Synonymy in No. 24.)

Mirpur Sakro, ♂ 1, ♀ 2,

(4) PIPISTRELLUS MINUS, Wr.

Dwarf Pipistrelle.

(Synonymy in No. 1.)

Mirpur Sakro, ♂ 1, ♀ 3, sex undetermined, 2 ; Gholam ♀ 1, in alcohol, 1.

(5) SCOTOPHILUS KUHLI, Leach.

The Common Yellow Bat.

(Synonymy in No. 1.)

Mirpur Sakro, ♂ 2.

The colour of the specimens is lighter than those from further North.

(6) FELIS AFFINIS, Gray and Hardwicke.

The Jungle Cat.

(Synonymy in No. 1.)

Gholam, ♀ 1.

(7) HERPESTES AUROPUNCTATUS PALLIPES, Blyth.

The Pale-footed Small Mongoose.

(Synonymy in No. 27.)

Gholam, ♀ 1, Gharo ♂ 2, ♀ 1, Bohara ♂ 1, Tatta ♀ 1, Ketti ♂ 1, ♀ 1, Bagan Indus River ♂ 1, ♀ 2.

(8) HERPESTES EDWARDSI, Geoff.

The Common Indian Mungoose.

(Synonymy in No. 1, under *M. mungo.*)

Tatta, ♀ 1.

This specimen is distinctly coloured as this species, and not *H. e. ferrugineus.*

(9) CANIS INDICUS KOLA, Wr.

The Jackal.

(Synonymy in No. 1, under *C. aureus.*)

Gharo, ♂ 1, Tatta, ♂ 1.

(10) FUNAMBULUS PENNANTI ARGENTESCENS, Wr.

The Northern Five-striped or Sind Banyan Squirrel.

(Synonymy in No. 24.)

Bohara, ♀ 1, Tatta ♂ 1, Mirpur Sakro ♂ 10, ♀ 9, Gharo ♂ 2, ♀ 2, Gholam ♂ 7, ♀ 6.

(11) CHELIONES HURRIANÆ, Jerd.

The Indian Desert Gerbil.

(Synonymy in No. 3, under *Meriones hurrianæ*)

Mirpur Sakro, ♂ 2, ♀ 3.

The habits of this creature have been described by Mr. Prater in vol. xxiv, No. 4, p. 756 of the *J. B. N. H. S.* (1916).

(12) TATERA SHERRINI, WR.

The Sind Gerbil.

(Synonymy in No. 1.)

Gharo, ♂ 2, ♀ 2, Gholam, ♂ 2, ♀ 1, Tatta, ♂ 1, ♀ 1,

(13) DIPODILLUS INDUS, Thos.

The Sind Dipodil.

(Synonymy in No. 10.)

Gharo, ♀ 2.

This species was definitely established by Mr. Thomas in his paper in the *J. B. N. H. S.* of December 1920.

(14) NESOKIA INDICA, Hardwicke.

The Rajputana Mole Rat.

(Synonymy in No. 24.)

Gholam, ♀ 1, Tatta, ♂ 1.

(15) LEGGADILLA SADHU, Wr.

The Deccan Spiny Mouse.

(Synonymy in No. 3.)

Tatta, ♀ 2, in alcohol 1.

(16) LEPUS DAYANUS, Blanf.

The Sind Hare.

(Synonymy in No. 3.)

Gholam, ♂ 2, ♀ 4.

II

REPORT NO. 39, MERGUI ARCHIPELAGO

BY MRS. HELEN M. LINDSAY.

COLLECTION	No. 39.
LOCALITY	Mergui Archipelago.
DATE	September, 1921 to May, 1922.
COLLECTED BY	Mr. C. Primrose.

In some measure this collection may be considered as supplementary to that made by Mr. G. C. Shortridge in 1914 in South Tenasserim, for he also visited Mergui Township. But Mr. Primrose was occupied mainly with the islands that form the Mergui Archipelago, whose area lies between 10°N. and 13°30′ N. Latitude and 97°30′ E. and 98°50′ E. Longitude, extending along the whole western shore of the Mergui District. It was described in 1838 as possessing uncommonly fine and picturesque scenery—'the ocean on every side spotted with green islands and islets, all densely wooded and of all sizes and forms, some low and very level, others with bold rocky shores rising into mountain ridges'. The *Burma Gazetteer* of 1912 reports the Archipelago as consisting of 804 islands, nearly all forest clad, hilly for the most part and often fringed with mangrove swamps but some with yellow beach of sand or pebble. In his tour diary Mr. Primrose frequently remarks on the great difficulty he experienced in penetrating the luxuriant jungle growth. The climatic conditions too were difficult, heavy rain continually interfering with the work of collection and preparation of specimens. The average rainfall given for Mergui Township in the *Burma Gazetteer* is 162·77 inches.

From north to south the islands visited by Mr. Primrose were :—

(1) Tavoy. This is inhabited, but is covered with dense secondary jungle full of thorny creepers.
(2) King's Island, the largest of the group. It has an area of 170 square miles and is partly cultivated by Burmese and Karens. Mr. Primrose reports it as having heavy forest almost devoid of mammals.
(3) Elphinstone Island.
(4) Ross Island. Both mammals and birds are scarce here.
(5) Sir John Hayes Island, very rocky with large boulders of granite.
(6) Criddle's Island—south of Ross Island.
(7) Kisseraing. This has a few fishing villages.

(8) Malcolm's Island—it is covered with forest of most luxuriant growth with much cane.
(9) Lampi or Sullivan's Island.
(10) Gregory Group of islets—alongside the south-east shore of Lampi Island.
(11) Hastings Island has its hill-sides covered with a tangled mass of creepers. The whole island is rocky.
(12) Barwell Island—east of Hastings Island.

Only (1), (2) and (7) were inhabited.

In addition Mr. Primrose collected also from Mergui Town and from the Nathay Mine on the mainland opposite Tavoy Island near Palauk on the boundary of the Mergui District.

The collection numbers 585 specimens belonging to twenty-five genera. Mr. Primrose states that as a whole the Archipelago is not rich in mammalia and claims that his specimens represent practically all the species any collector would be likely to get in a six months' trip. He was told by the Burmese of the existence on King's Island of *Lutra sp.* and *Sciuropterus spadiceus*, but was unable to obtain any specimens. *Lutra* has been seen on Elphinstone Island and *Sciuropterus spadiceus* was seen by Mr. Primrose on Lampi Island. The Mergui specimens belong almost wholly to the small mammals, while in the collection from south Tenasserim the almost complete absence of these (exclusive of bats) was noted. Two species of *Pteropus* were found, *Pteropus vamp. malaccensis* from Mergui Town and Tavoy Island and *Pteropus hyp. geminorum* from Sir John Hayes Island, thus supplying the deficiency noted in the Tenasserim Report.

(1) MACACA ADUSTA, Mill.

The Malay Pig-tailed Monkey.

(Synonymy in No. 17.)

Lampi Island, ♂ 1.

(2) MACACA IRUS, F. Cuvier.

The Kra or Crab-eating Monkey.

(Synonymy in No. 17.)

It is noted in the report on the Mammals from the Rhio Archipelago by Mr. Thomas and Mr. Wroughton that 'the Peninsular form of this macaque is very variable, but it is not improbable that the smaller brighter race inhabiting the more inland districts may be sub-specifically distinct.' When more material from the Mergui Archipelago is available, it may be found that the insular species of the more northerly region is also distinct as a larger brighter race. Only one specimen was obtained in the present collection. Its colour is brighter than other specimens from Tenasserim or Malay, its tail is 495 mm., head and body 520 mm. The skull length is 5·75 inches, its breadth 3·5 inches.

King's Island, ♂ 1. Vernacular name—MIOUK (Burmese).

(3) PITHECUS OBSCURUS, Reid.

The Dusky Leaf Monkey or Dusky Langur.

(Synonymy in No. 17.)

Malcolm Island, ♀ 1, very young, King's Island, ♂ 1.

Vernacular name—THA-THO (Karen).

(4) NYCTICEBUS COUCANG. Bodd.

The Slow Loris.

Vernacular name—MIOUK-MOMA (Burmese), THASAY (Karen).

(Synonymy in No. 17.)

King's Island, ♂ 1.

(5) PTEROPUS VAMPYRUS MALACCENSIS, And.

The Malay Flying Fox.

1760. *Pteropus vampyrus* (Linnæus.)
1810. *Pteropus edulis* (Geoffroy, Ann. Mus., xv, p. 90).
Pteropus intermedius. (K. Andersen.)
1903. *Pteropus vampyrus.* (Bonhote, Fasciculi Malayensis Zool., pt. i, p. 14.)
1908. *Pteropus vampyrus malaccensis.* (K. Andersen, Ann. and M. N. H. (8) ii, p. 368.)

Kloss in his paper ' On some Siamese Mammals ' in 1916, remarks that this species ' has not been recorded with certainty ' further north in the Peninsula than Patani (8°N. Latitude) though it occurs again in south-east Siam. Elsewhere in Siam and in Tenasserim its place is taken by a smaller species known as *Pteropus intermedius*, Andersen. The specimens in this collection are certainly *P. v. malaccensis* and they have come from Tavoy Island on 13°30′ N. Mr. Primrose notes that these creatures come long distances from other islands for fruit and this probably accounts for its distribution in a more northerly direction extending from Kisseraing and adjacent islands on 11°50′N. to Tavoy in this Archipelago.

Mergui Town, ♂ 4, ♀ 1; Tavoy Island, ♀ 9; Kisseraing Island, ♀ 6; Gregory group, ♂ 1; Malcolm Island, ♀ 1; Barwell Island, ♀ 2, ? 2

Vernacular name—LIUSWE (Burmese); BLAKANA (Karen).

(6) PTEROPUS HYPOMELANUS GEMINORUM, Mill.

The Lesser Burmese Flying Fox.

1860. *Pteropus nicobaricus*, Fitzinger, *Wien Akad.*, p. 389.
1881. *Pteropus nicobaricus*, J. Anderson, *Cat. Mamm. Ind. Mus.*, pt. I, p. 103.
1903. *Pteropus geminorum*, Miller, *Smith's Misc. Coll.*, xlv, p. 60.

The female specimens are lighter coloured on the shoulder and greyer on the back than the males.

(7) CYNOPTERUS BRACHYOTIS ANGULATUS, Mill.

The Malay Short-nosed Fruit Bat.

(Synonymy in No. 17.)

Malcolm Island, ♂ 6, ♀ 13; Tavoy Island, ♀ 1, ? 1.

Vernacular name—LUINOO (Burmese), BLA (Karen).

(8) HIPPOSIDERUS ATRATUS, Kelaart.

The Bicoloured Leaf-nosed Bat.

(Synonymy in No. 3.)

Margui ♂ 5, ♀ 2.
Vernacular name—LUINOO (Burmese), BLA (Karen).

(9) MEGADERMA SPASMA MEDIUM, K. And.

The Malay Vampire Bat.

(Synonymy in No. 5) also

1918. *Megaderma spasma medium*, K. Andersen.
Tavoy Island, ♀ 2; Ross Island, ♀ 2; Mergui, ♀ 1.

(10) TYLONYCTERIS PACHYPUS, Temm.

The Club-footed Bat.

1835. *Vesperugo pachypus*, Temminck, Monag. Mamm., ii, p. 217.
1872. *Tylonycteris pachypus et meyeri*, Peters, M. B. Akad. Berl., p. 704.
1888. *Vesperugo pachypus*, Blandford, Mamm. No. 180.

The three specimens from Nathé Mine, a little inland and on the slopes of the hill about 1,000 feet up, are smaller in size than these from Tavoy Island. The forearm is 22–26 mm.

Tavoy Island, ♂ 5, ♀ 9 ; Nathé Mine, ♀ 3.

(11) PIPISTRELLUS COROMANDRA, Gray.

The Coromandel Pipistrel.

(Synonymy in No. 5.)

Mergui, ♂ 2, ♀ 1.

(12) SCOTOPHILUS CASTANEUS, Horsf.

The Chestnut Scotophil.

1824. *Nycticejus castaneus*, Horsf., Cat., pp. 37, 38.
1846. *Scotophilus temminckii*, Cantor, *J. A. S. B.*, xv, p. 185.
1900. *Scotophilus castaneus*, Thomas and Wroughton, *J. F. M. S. Mus.*, iv, p. 100.

Mergui town, ♂ 1.

(13) MYOTIS MURICOLA, Gray.

The Wall Bat or Moustachioed Bat.

(Synonymy in No. 17.)

Ross Island, ♂ 2, ♀ 2.

(14) MYOTIS (LEUCONŒ) HASSELTI, Temm.

Van Hasselt's Bat.

(Synonymy in No. 18.)

The single specimen obtained has forearm 41 mm., tail 42 mm., head and body 55 mm., ear 17 mm. No skull was sent.

Mergui town, ♀ 1.

(15) EMBALLONURA MONTICOLA, Temm.

The Malay Sheath-tailed Bat.

(Synonymy in No. 17.)

These specimens mark a more northerly record for the occurrence of this genus. King's Island is 2° farther north than Victoria Point where the specimens described in No. 17 were found. The measurements were forearm 43–45 mm., head and body 43–47 mm., tail 11–14 mm., ear 14 mm.

Mr. Primrose notes that these bats fly readily and well in day-light. Ross Island, ♀ 2 ; King's Island, ♂ 2, ♀ 1 ; Criddle's Island, ♀ 1.

(16) TUPAIA BELANGERI BRUNETTA, Thos.

The Tenasserim Tree Shrew.

(Synonymy in No. 17) also No. xxxv of vol. xxix of *J. B. N. H. S.*, p. 84.

This species is common on Tavoy Island where it prefers the low secondary jungle growing on old 'Taungya' clearings to the heavy forest. It varies considerably in colour. Vernacular name—SWAY (Burmese), WHEYSOONA (Karen).

Tavoy Island, ♂ 6, ♀ 6 ; Ross Island, ♂ 11, ♀ 8 ; King's Island, ♂ 3, ♀ 5

(17) TUPALA CLARISSA, Thos.

The Malay Tree Shrew.

19 7. *Tupaia clarissa*, Thomas, *J. B. N. H. S.*, xxv, No. 2 of 1917.

This species was definitely determined by Mr. Thomas in his account of the Tupaias of South Tenasserim in *Journal of Bombay Natural History Society*, vol. xxv, No. 2 of 1917. He notes that it cannot have a very wide distribution, as it is replaced by *T. belangeri* at Tenasserim town. It is interesting that in the Mergui Archipelago the distribution is similar. Thus *T. clarissa* is found in the southerly islands and *T. belangeri* in the northerly ones. Mr. Thomas refers to this fact in his papers No. XXXVII in vol. xxix of the *J. B. N. H. S.*, p. 84.

Kisseraing Island, ♂ 2; Malcolm Island, ♂ 2, ♀ 1.
Sullivan Island, ♂ 1, ♀ 1; Hastings Island, ♀ 2.

(18) PACHYURA, Sp.

The Musk Rat.

Mergui Town, ♂ 1.

(19) GALEOPTERUS PENINSULAE, Thos.

The Malay Flying Shrew.

(Synonymy in No. 17.)

Kisseraing Island, ♀ 2, both immature.

(20) ARCTOGALIDIA LEUCOTIS, Horsf.

The Small-toothed Palm Civet or Burmese Tree Civet.

(Synonymy in No. 17.)

1897. *Arctogalidia merriam*, Science, v. p. 302.
King's Island, ♂ 1.

(21) PETAURISTA MERGULUS, sp. n. Thos.

The Mergui Flying Squirrel

1922. *Petaurista mergulus*, Thomas, *J.B.N.H.S.*, xxviii, p. 1067.
Tavoy Island, ♀ 1; Ross Island, ♂ 3, ♀ 3.

(22) PETAURISTA MERGULUS REGULI, Thos. sub sp. n.

The Mergui Flying Squirrel.

1922. *Petaurista mergulus reguli*, Thomas, *J.B.N.H.S.*, vol. xxxi, p. 22.
King's Island, ♀ 1.

(23) PETAURISTA MERGULUS PRIMROSEI, Thos sub sp. n.

Primrose's Flying Squirrel.

1922. *Petaurista primrosei*, Thomas, *J.B.N.H.S.*, vol. xxxi, p. 22.
Malcolm's Island, ♀ 1; Sullivan Island, ♀ 3.

(24) RATUFA MELANOPEPLA CELALNOPEPLA, Mill.

The Burmese Flying Squirrel.

1900. *Ratufa melanopepla*, Miller, Proc. Wash. Acad. Sci., ii, p. 71.
1913. *Ratufa melanopepla celænopepla*, Miller, Smithson Misc. Coll. lxi, No. 21, p. 27.

This species was determined on the examination of three specimens from Domel Island, Mergui Archipelago, collected by Dr. W. L. Abbot in 1904. The present specimens are from neighbouring islands.

King's Island, ♂ 2; Lampi Island, ♂ 1; Kisseraing Island, ♂ 5, ♀ 3.
Vernacular name—LIUTHAY (Burmese), THABAKO (Karen).

(25) CALLOSCIURUS EPOMOPHORUS HASTILIS, Thos.

The Hastings Island Epaulet Squirrel.

1922. *Callosciurus epomophorus hastilis* sub sp. n. Thomas, *J.B.N.H.S.*, xxix, p. 377.

The colour of this squirrel is distinctly greyer than the species named *domelicus* or *davisoni*.

Hastings Island, ♂ 3, ♀ 2, ? 2.

(26) CALLOSCIURUS EPOMOPHORUS TABAUDIUS, Thos. sub sp. n.

The Tavoy Island Epaulet Squirrel.

1922. *Callosciurus epomophorus tabaudius*, Thos. *J.B.N.H.S.*, xxxv, p. 1067.
Tavoy Island, ♂ 3, ♀ 2.

(27) CALLOSCIURUS EPOMOPHORUS SULLIVANUS, Miller.

The Sullivan Island Epaulet Squirrel.

1903. *Sciurus sullivanus*, Miller, Smithson. Misc. Coll., lxv. p. 17.
Sullivan Island, ♂ 3.

(28) CALLOSCIURUS EPOMOPHORUS DOMELICUS, Miller.

The Domel Island Epaulet Squirrel.

1903. *Sciurus domelicus*, Miller. Smithson. Misc. Coll., lxv, p. 18.
Kisseraing Island, ♂ 10, ♀ 3 ; Malcolm Island, ♂ 2.

(29) CALLOSCIURUS EPOMOPHORUS DAVISONI, Bonh.

The Burmese Epaulet Squirrel.

(Synonymy in No. 17).

Vernacular name—SAE (Burmese), LIPOA (Karen).
Nathé mine, Mergui District, ♂ 8, ♀ 11 ; Saka Chaung, ♂ 1.
Mergui, ♂ 2, ♀ 2 ; King's Island, ♂ 7, ♀ 3.

(30) MENETES BERDMOREI, Blyth.

Berdmore's Squirrel.

(Synonymy in No. 17).

In addition, see 1914. Thomas, *J.B.N.H.S.*, xiii, p. 23.
Lampi Island, ♂ 1, ♀ 2 ; Kisseraing Island, ♂ 4, ♀ 1.

(31) TAMIOPS MACCLELLANDI BARBEI, Blyth.

The Striped Burmese Squirrel.

(Synonymy in No. 14.)

Vernacular name—SWAY (Burmese), LELAY (Karen).
King's Island, ♂ 3, ♀ 1 ; Kisseraing Island, ♂ 4, ♀ 1.

(32) GUNOMYS VARIUS, Thos.

The Malay Mole Rat.

(Synonymy in No. 17 ; also see reports Nos. 29 and 35).
Mergui town ♂ 3 (2 young), ♀ 2 (1 young).

(33) RATTUS CONCOLOR, Blyth.

The Little Burmese Rat.

(Synonymy in No. 16 ; see also reports Nos. 17 and 20).
Tavoy Island, ♂ 1 ; Ross Island, ♀ 1 ; King's Island, ♀ 2.

(34) RATTUS BERDMOREI, Blyth.

The Burmese Gray Rat.

1851. *Rattus berdmorei*, Blyth. *J.A.S.B.*, xx, p. 173.
A damaged specimen now handed over to the B.M.
Nathé Mine, Mergui District, ♀ 1.

(35) RATTUS SURIFER, Miller.

The Malay Spiny Rat.

(Synonymy in No. 17.)

Mergui town, ♀ 1 ; Tavoy Island, ♂ 13, ♀ 16 ; Ross Island, ♂ 5, ♀ 1.
King's Island, ♂ 10, ♀ 20 ; Sir John Hayes Island, ♂ 7, ♀ 12 ; Kisseraing Island, ♂ 18, ♀ 5 ; Malcolm Island, ♂ 4, ♀ 5 ; Lampi Island, ♀ 2 ; Hastings Island, ♂ 1.

(36) RATTUS RATTUS TIKOS, Hint.

The Tenasserim Rat.

1918. *Rattus rattus tikos*, Hinton. *J.B.N.H.S.*, xxvi, pp. 59, 384.
Tavoy Island, ♂ 6, ♀ 3 ; Ross Island, ♂ 1 ; King's Island, ♂ 7, ♀ 1.
Sir John Hayes Island, ♂ 15, ♀ 8 ; Criddle's Island, ♂ 5, ♀ 3 ; Lampi Island, ♂ 3, ♀ 4 ; Malcolm's Island, ♂ 12, ♀ 13 ; Hastings Island, ♂ 4, ♀ 4 ; Nathé Mine, ♂ 1.

(37) RATTUS VOCIFERANS, Mill.

The Long-tailed Malay Spiny Rat.

(Synonymy in No. 17.)

Tavoy Island, ♀ 3 ; Ross Island, ♂ 2, ♀ 2 ; King's Island, ♂ 4, ♀ 3 ; Kisseraing Island, ♂ 2, ♀ 3 ; Malcolm Island, ♀ 1.

Vernacular name—MTHAMAY (Karen).

(38) NYCTOCLEPTES CINEREUS. Mc. Cl.

The Large Burmese Bamboo Rat.

(Synonymy in No. 14.)

Nathé Mine, ♀ 2.

(39) TRAGULUS RAVUS LAMPENSIS, Mill.

The Little Malay Chevrotain.

1903. *Tragulus lampensis*, Miller, Proc. Biol. Socy. Wash. xvi, p. 42.
Lampi Island, ♂ 1, ♀ 1.

(40) TRAGULUS RAVUS MERGATUS, Thos. sub sp. n.

The little Malay Chevrotain.

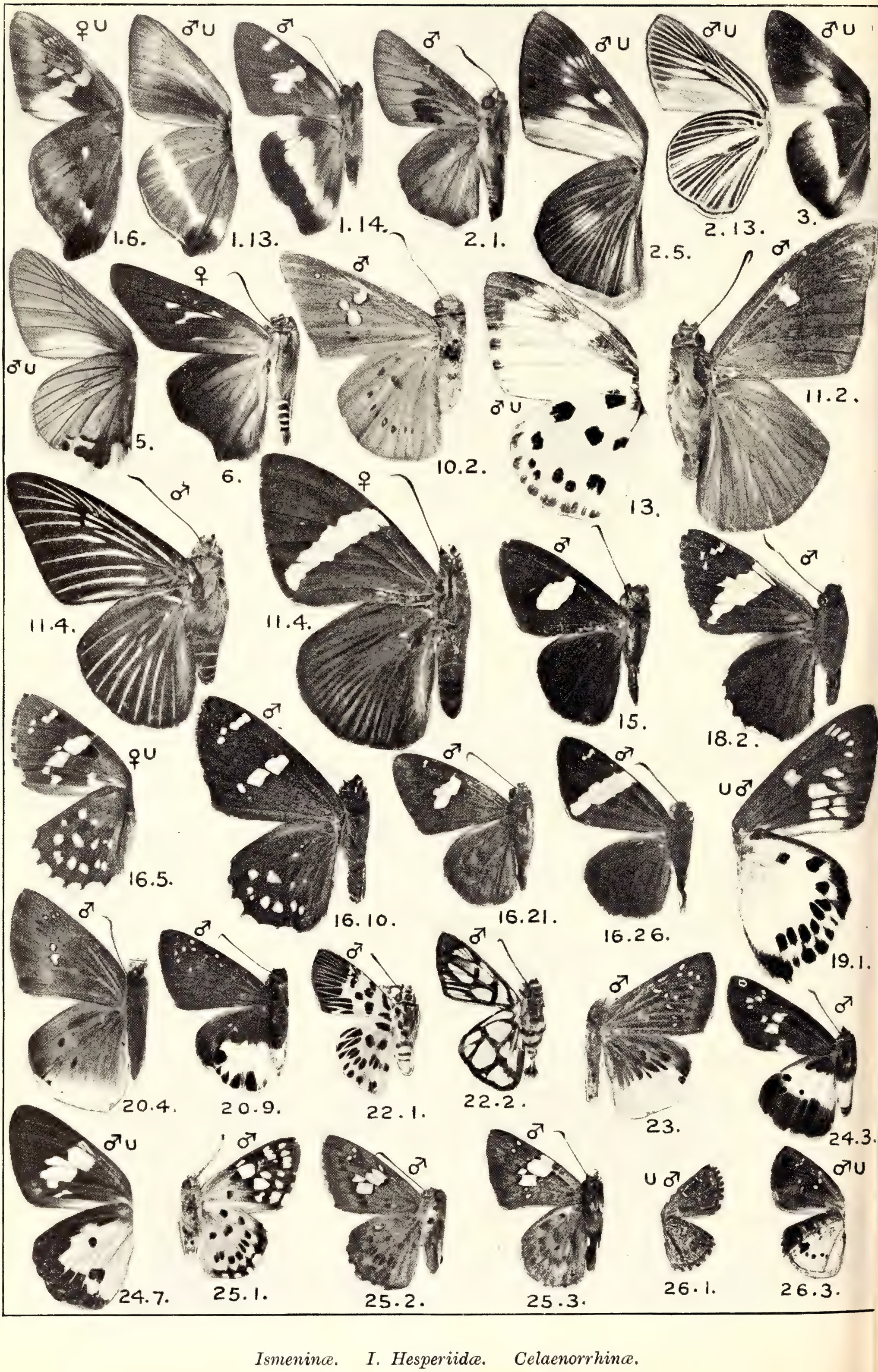
1922. *Tragulus ravus mergatus.* Thomas. *J.B.N.H.S.*, xxix, pp .84, 85.
King's Island, ♂ 1, ♀ 2 ; Kisseraing Island, ♀ 3.

Vernacular name—GEELONG (Burmese), THABOSOOBEE (Karen).

TRANSPORT

Mr. Primrose advises any future collector in this Archipelago to use a launch. If a country boat be used and that for longer than three months, it is cheaper to buy a boat outright and engage a Salône crew paid at a monthly rate. Tact is needed in working with Salônes as they are of timid nature, but as seamen and in morale they are so vastly superior to Burmans, it is worthwhile trying to get and keep them. The Loojee or headman of Nowlay, the dockyard of Mergui, can help with procuring a crew. In 1922 a boat cost from Rs. 360 to 500. As winds and currents cause much trouble, supplies should be calculated for double the time supposed to be enough for a journey. The anchor cable must be at least twenty fathoms length and of good strong rope.

Special thanks must be recorded to Mr. B. B. Jubb, General Agent, Mergui, and to Mr. T. E. Webster, Assistant Manager of the Burma Para Rubber Estate, King's Island.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♂ U
26.3.

Ismeninæ. I. Hesperiidæ. Celaenorrhinæ.

THE IDENTIFICATION OF INDIAN BUTTERFLIES

BY COL. W. H. EVANS, D.S.O., F.Z.S., F.E.S.

(*Continued from Vol. XXX, page 776.*)

Part IX

(*With 1 plate*)

I. Hesperiidae. Key to subfamilies and genera.

1a (33a). Body shorter than dorsum H. Larva on dicotyledons. Egg dome-shaped, ribbed.

1b (7a). Palpi 3rd joint peculiar, long, thin, naked, blunt, porrected in front of the face and looking rather like an awl ; emanating from a stout 2nd joint, which is erect and appressed to the face. Antennal club long, gradual, curved at the thickest part and tip pointed. F v2 from near base ; v4 nearer v5, which is nearer 6. H v2 never after v7 ; v5 well marked and usually nearer 6. H produced or angled at v1. H tibiae with 2 pairs of spurs. Wings erect in repose.

Ismeninae. Africa. India and China to Australia.

1c (5a). H v5 tubular, much nearer v6 ; cell = ½ wing.

1d (4). H v2 about opposite v7.

1 (2a). F v1 distorted at base. H tibiae fringed. ♂ often with a brand upf and v2 bent down towards v1.

Hasora, M. India and China to Australia. (= *Parata*, M.)

2a (1). F v1 sinuous but not distorted.

2 (3). Antennal club very long and gradual = ½ shaft. ♂ often with a brand upf and v2 displaced also the hind tibiæ swollen and tufted.

Ismene, Swainson. India and China to New Guinea. (= *Pola*, *Torthrix*, *Gecana*, *Burara*, *Sartora*, *Zehala*, Swin).

3 (2). Antennal club less than ½ shaft. H tibiae not swollen or tufted ; fringed.

Bibasis, M. India to Celebes.

4 (1d) H v2 well before v7. H tibiae fringed. ♂ no brand.

Allora, Waterhouse and Lyell. Moluccas to Australia. (*doleschalli*, Fd.).

5a (1c). H v5 not tubular, midway between vs 4 and 6 ; v2 well before v7.

5(6). H cell = ½ wing. ♂ hind tibiae with a long tuft. F cell normal ; v4 midway between vs 3 and 5.

Rhopalocampta, Wallengren. Africa, India and China to New Guinea. (= *Choaspes*, M).

6 (5). H cell much less than ½ wing. H tibiae fringed. F cell very long and narrow ; v4 nearer v5.

Badamia, M. India and China to Australia.

7a (1b). Palpi 3rd joint short, stout and conical. F v2 from near base ; v5 nearer v6. H v5 well marked and nearer v6 ; v2 before or opposite v7. Antennal club shorter ; curved or angled at or before middle of club, or at thickest part. Wings flat in repose. ♂ never with a brand or tuft of hairs on the wings.

Celaenorrhinae. America. Africa. India and China to Australia.

7b (14a). H v5 tubular ; tornus rounded. Palpi porrect ; 3rd joint short ; 2nd joint yellow below. Antennæ = ½ costa : bent in the middle of the club ; pointed.

Capila Group.

7c (10a). Hind tibiae only with terminal spurs ; fringed. Clasp of genitalia single, elongate and pointed.

7 (8a). Palpi 3rd joint long. Small size—32 mm.

Exometoeca, Meyrick. West Australia (Albany). (*nycteris*, Mey).

8a (7). Palpi 3rd joint very short. Large—over 40 mm.

Capila Group—(*contd.*)

8 (9). F v4 mid 3–5; internal cell veinlet forks to bases vs 4 and 5. ♂ no costal fold on F. Eyes red.

Phœnicops, Watson. Australia. (*beata* and *denitza*, Hew).

9 (8). F v4 twice as near v5 as v3; internal cell veinlet forks to just beyond base v3 and to base v5. ♂ with costal fold F. Eyes brown. (*critomedia* is aberrant).

Casyapa, Kirby. Moluccas to Australia: (6 species). (=*Chaetocneme*, Fd.).

10a (7c). Hind tibiae with 2 pairs of spurs; tufted in ♂. Clasp of genitalia large, trifid.

10 (11a). Palpi 3rd joint very short and inconspicuous. Eyes red. ♂ usually with a costal fold.

Orthophœtus, Watson. N. India and China to Borneo. (= *Pteroxys*, Wat).

11a (10). Palpi 3rd joint short, but conspicuous. Eyes golden brown or black. ♂ no costal fold.

11b (13). Wings broad; F termen equal to or longer than dorsum.

11 (12). ♂ with no secondary sexual characters on wings.

Capila, M. N. India and China to Siam and Hainan. (=*Pisola*, M.)

12 (11). ♂ dorsum H turned over and with a long tuft of hairs at the tornus.

Crossiura, DeN. N India, China and Hainan.

13 (11b). Wings narrow; F dorsum longer than termen. H termen very rounded.

Calliana, M. India, China, Malay States and Borneo.

14a (7b). H v5 not tubular.

14 (15a). Hind tibiae with single pair of spurs; plain. A jugum at the base of the wings as in the Heterocera. Wings very long and narrow. ♂ unh a brown brand along v1. A very aberrant genus.

Euschemon Group.

Euschemon, Db. Australia. (*rafflesia*, McLeay.) (= *Froenati*, Mab.)

15a (14). Hind tibiae with two pairs of spurs.

Celaenorrhinus Group.

15b (20a). F length cell = $\frac{2}{3}$ costa and as long as dorsum. Antennæ pointed. Apex F not truncate.

15c (17a). Palpi 3rd joint inconspicuous, in continuation of 2nd joint which is erect or sub-erect.

15 (16). F v4 much nearer 5 than 3; internal veinlets fork to base v5 and mid. 3–4. ♂ hind tibiae with a tuft of yellow hairs.

Charmion, DeN. Burma to Celebes.

16 (15). F v4 about mid 5 and 3; internal veinlets to bases 4 and 5. ♂ hind tibiae with a tuft of brown hairs.

Celaenorrhinus, Hub. America, Africa, India and China to Celebes. (= *Gehlota*, Doh and *Hantana*, M.).

17a (15c). Palpi porrect.

17 (18a). F v4 further from 3 than from 5; lower cell veinlet to mid 3–4; v5 very slightly bent down at origin parallel to v4.

Hewitsonia, nov. type *aenesius*, Hew. Papuan area. (4 species.)

18a (17). F v4 mid 3–5; lower cell veinlet to base v4; v5 normal. Hind tibiae fringed.

18 (19). ♂ with a costal fold. Wings rounded; H tornus toothed at v1.

Achalarus, Scudder. N. America, N. India and China. (= *Lobocla*, M.)

19 (18). ♂ no costal fold. Apex F and tornus H produced.

Satarupa, M. N. India and China to Java and Borneo.

20a (15b). F cell markedly shorter than dorsum or $\frac{2}{3}$ costa. Palpi porrect.

20b (27a). Apex F not truncate; termen even throughout or slightly excavate in 1.

20c (23a). H tibiae fringed.

20d (22). Antennæ bent in the middle of the club.

20 (21). F mv very arched between origins vs 2 and 3. Palpi 2nd joint smooth, brown tipped and rest white.

Tagiades, Hub. Africa, India and China to Australia.

21 (20). F mv straight. Palpi yellow below.

Abraximorpha, Elwes. N. India, N. Burma and China.

Celaenorrhinus Group—(*contd.*)

22 (20d). Antennæ aberrant, bent near end, beyond thickest part of club; apiculus very slender and short. Wings produced.

Odina, Mab. N. India to Celebes.

23a (20c). Hind tibiae with a tuft in the ♂.

23 (24a). Mid tibiae with a tuft in the ♂, an unique feature.

Mooreana, nov. Type *trichoneura*. N. India to New Guinea.

24a (23). Mid tibiae plain.

24b (26). H dorsum longer than or = costa.

24 (25). H costa evenly rounded at the apex.

Daimio, Murray. India and China to Celebes.

25 (24). H costa distinctly angled at the apex (end v8).

Coladenia, M. Afica, India and China to Philippines.

26 (24b). H costa longer than the dorsum. Antennæ chequered, club and crook very short.

Sarangesa, M. Africa, India to Malay Peninsular.

27a (20b). Apex F distinctly truncate.

27b (29. 30a). Apex F truncate at end v3. H more or less angled at end of v4.

27 (28). Hind tibiae fringed.

Darpa, M. N. E. India to Philippines.

28 (27). Hind tibiae tufted in ♂.

Tapena, M. India to Malay Peninsular.

29 (27b. 30a). Apex F truncate at end v5. ♂ with a costal fold F. Hind tibiae fringed. Palpi 3rd joint unusually long. H angled at end v4.

Netrocoryne, Fd. Australia. (*repanda*, *Fd*).

30a (27b. 29). Apex F truncate at end v4. H more or less angled at end vs 4 and 7.

30. (31a). Antennæ tip pointed. Hind tibiae with tuft in ♂.

Ctenoptilum, DeN. N. E. India, China and Burma.

31a (30). Antennæ tip blunt.

31 (32). ♂ with a short dense tuft of white hairs on the fore coxae. Hind tibiae fringed.

Odontoptilum, DeN. India and China to Celebes.

32 (31). ♂ with a long pencil of radiating black hairs attached to the fore coxae. Hind tibiae plain.

Caprona, Wallengren. Africa, India to Celebes. (= *Abaratha*, M. and *Gerosis*, Mab.).

33a (1a). Body as long or longer than dorsum H.

33b (47a). F v5 rather nearer v6 than v4.

33c (37a). H end cell straight; v2 well before v7; v5 well marked rather nearer v4. F v2 mid base and v11; end cell straight. Antennæ = ½ costa; club short, stout and blunt. Palpi long, slender, porrect, usually hairy; 3rd joint stout, short but prominent, porrect. ♂ may have a costal fold upf, a tuft unf or the hind tibiae tufted. Wings rounded. Wings flat, erect or semi-erect in repose; low flying. Larva on dicotyledons. Eggs strongly ribbed.

Hesperiinae.

33 (34a). Antennæ club straight. Cilia plain.

Gomalia, M. Africa, India.

34a (33). Antennæ club more or less bent.

34b (36). F v4 mid vs 3 and 5. Cilia prominently chequered.

34 (35). H termen even. ♂ may have costal fold upf and a tuft on the hind tibiae.

Hesperia, Fab. N. America, Africa, Europe to India and China. = *Pyrgus*, Hub.; *Spialia*, Swin.; *Powellia*, Ob.; *Urbanus*, Hub.; *Erynnis*, Schrank; *Scelothrix*, Ramb.; *Syricthus*, Bdv.; *Muschampia*, Ob.).

35 (34). H termen crenulate. ♂ with costal fold upf and may have tuft unf.

Carcharodus, Hub. N. Africa, Europe to N. W. India. (= *Spilothyrus*, Dupon).

36 (34b). F v4 much nearer v3 than v5. ♂ may have costal fold upf.

Nisoniades, Hub. N. America, Europe to Chitral and China. (= *Thanaos*, Bdv. and *Thymele*, F.).

37a (33c). H upper apex of cell produced, nearer termen than lower edge; internal cell veinlet has a fork to the origin of v4; vs 2 and 7 opposite.

Hesperiinae—(*contd.*)

F v2 mid base and v11 or nearer v11. Antennæ club stout, usually hooked and may be pointed. Palpi inconspicuous; 2nd joint rather flattened, semi-erect or porrect; 3rd joint in continuation of 2nd joint, short, stout, conical, prominent. ♂ may have a brand upf. Body stout. Wings erect in repose.

Trapezitinae. Confined to Australian Region.

37b (41a). ♂ no brand.

37 (38a). H tibiae with terminal spurs only.

Mesodina, Meyrick. Australia. (3 species).

38a (37). H tibiae with 2 pairs of spurs.

38a (39a) Antennæ sharp pointed.

Trapezites. Hub. Australia to New Guinea. (12 species) (= *Putlasingha,* Wat.).

39a (38). Antennæ blunt.

39 (40). F termen rather shorter than dorsum.

Anisynta, Lower. Australia. (6 species).

40 (39). F termen much shorter than dorsum.

Oreisplanus, Waterhouse and Lyell. Australia. (2 species).

41a (37b). ♂ with a brand upf. H. tibiae with 2 pairs of spurs.

41b (45a). Antennæ tip pointed.

41 (42a). ♂ with oval brand upf; v1 distorted at ⅓ from base.

Signeta, Waterhouse and Lyell. Australia. (2 species)

42a (41). ♂ with linear brand.

42 (43. 44). Uph orange or yellow central band.

Hesperilla, Hew. Australia. (9 species).

43 (42. 44). Uph unmarked.

Toxidia, Mabille. Australia to New Guinea (11 species). (= *Telesto,* Bdv. and *Oxytoxia,* Mab.).

44 (42. 43). Uph with a pair of hyaline discal spots.

Neohesperilla, Waterhouse and Lyell. Australia. (4 species).

45a (41b). Antennæ tip blunt.

45 (46). Antennal club hooked or strongly bent before middle.

Motasingha, Watson. Australia. (4 species).

46 (45). Antennæ club evenly and only slightly bent in middle. Tegumen slender, pointed, quite different to rest.

Dispar, Waterhouse and Lyell. Australia. (*compacta,* But).

47a (33b). F v5 always nearer to v4 than to v6; the dcv vs 6 to 5 always distorted just before v5. Hind tibiae may be fringed, but never tufted in ♂. ♂ never with a costal fold upf. Wings erect in repose, or lower wings may be depressed and given a rotating motion in a horizontal plane. Larva on monocotyledons (except *Cupitha*).

Pamphilinae.

47b (81a). Antennæ bent at the middle or thickest part of the club.

Section 1.

47c (75a). Palpi 3rd joint protruding. Eyes never red. H v2 before or opposite v7 (except *Ge*).

47d (61a). Palpi entirely porrect, 3rd joint prominent, stout. F v5 straight. Antennæ short = costa or less; apiculus very short or absent.

47e (59a). H v2 well before v7 (except where latter is distorted in ♂♂ of *Aeromachus* and *Ampittia*).

47f (55a). F v2 before v11.

47g (50a). H v2 from before middle v8; v2 from mid base and end cell or nearer base. Antennæ club stout and blunt. Palpi 2nd joint slender and clothed with long hairs. Abdomen very long (except *C. pulchra*). H much produced below costa. F tibiae without epiphysis.

Heteropterus Group.

47 (48a). F v3 opposite v9. H tibiae with single pair of spurs (2 in *C. abax*). Hyaline white or yellow markings.

Carterocephalus, Led. Europe to China, N. E. India and N. Burma. (= *Aubertia,* Ob.: and *Pamphila,* Auct.: *Steropes,* Bdv.).

48a (47). F v3 opposite v10. No hyaline markings.

Heteropterus Group—(*contd.*)

48 (49). Hind tibiae with single pair of spurs. Unh no spots.
Leptalina, Mab. Japan to Central China. (*unicolor*, Br and Gr).
49 (48). Hind tibiae with 2 pairs of spurs. Unh with prominent spots. Cilia F chequered.
Heteropterus, Dumeril. Europe to Japan. (*morpheus*, Pallas).
50a (47g). H v7 from middle or before middle of v8 and v2 always nearer end cell than base. H tibiae with 2 pairs spurs and fore tibiae with epiphysis.

Isoteinon Group.

50b (52a). Abdomen longer than dorsum. Antennæ with short, pointed apiculus. F with white spots.
50 (51). F cilia chequered. Tegumen divided. Unh yellow with numerous large, white spots. F with prominent hyaline spots.
Isoteinon Fd. Japan to Tonkin. (*lamprospilus*, Fd.).
51 (50). F cilia plain. Tegumen undivided. Unh grey with few whitish spots. F with obscure semi-hyaline spots.
Elwesia, **nov.** Chitral. Type *lesliei*, **nov.**
52a (50b). Abdomen = dorsum. F no discal hyaline spots.
52 (53a). Antennæ club blunt, stout, arcuate. F broad; Unh narrow-yellow band.
Barca, DeN. W. Thibet. (*bicolor*, Ob). (= *Dejeania*, Ob.).
53a (52). Antennæ club gradual, short, fine pointed apiculus.
53 (54). F vs 11 and 12 separate; v2 from near base. Unmarked.
Apostictopterus, Leech. (= *Tacupa*, Swin.). W. China to N. E. India.
54 (53). F vs 11 and 12 approximate; v2 from just before v11. Unmarked except for small hyaline apical spots F and unh more or less obscure ferruginous bands.
Astictopterus, Fd. China and N. E. India to Philippines.
55a (47f). F v2 opposite v11. No hyaline spots.

Ampittia Group,

55b (57a). F v5 quite straight. ♂ no brand. Below with prominent scaling. Antennae club gradual with short, pointed apiculus.
55 (56). F v6 from well below apex cell; costa highly arched. Upf no prominent markings.
Ochus, DeN. N. E. India to Tonkin.
56 (55). F v6 from end cell; costa straight. Upf usually with prominent discal and apical yellow spots.
Baracus, M. India, N. Burma, Philippines.
57a (55b). F v5 slightly bent down at origin. ♂ may have a brand upf from v1 to v2 and on H vs 6 and 7 hairpinwise.
57 (58). Above with prominent yellow markings and unh with yellow scaling. Antennæ apiculus absent or very short and gradual.
Ampittia, M. India and China to Sumatra.
58 (57). Above unmarked or with small white spots; unh olive grey or black. Antennæ apiculus short and gradual or very fine and abrupt.
Aeromachus, DeN. India, China and Japan to Philippines. (= *Machacus*, Swin.).
59a (47e). H v2 about opposite v7. F hyaline white spots.

Arnetta Group.

59 (60). F v2 nearer end cell than base.
Pedestes, Watson. N. E. India.
60 (59). F v2 nearer base than end cell. ♂ in two species with a tuft of hairs unf and bases vs 2 and 3 H swollen.
Arnetta, Watson, India, Burma, Sumatra.
61a (47d). Palpi never conspicuously porrect, 2nd joint semi-erect or erect. Antennæ apiculus well defined.
61b (71a). F v5 not bent down at origin, so as to be very much nearer v4 than to v6.
61c (66a). Palpi 3rd joint long, slender, erect. (except in some *Koruthaialos*).

Suastus Group.

61d (64a). F v11 not running close to v12. Antennæ apiculus short.

61e (63). F v2 from mid base and v11.

61 (62). H v2 from well before v7. F v4 nearer to v3 than v5. ♂ may have alar sex marks.

Iambrix, Watson. India and China to Java and Borneo. (= *Mimambrix*, Riley and *Idmon*, DeN).

62 (61). H v2 opposite v7. F v3 mid vs 4 and 5. F usually with hyaline spots.

Suastus, M. India to Sumatra and Borneo.

63 (61e). F v2 from just before v11. ♂ upf a seam from mid v1 to base v4. Hyaline spots F and H.

Inessa. DeN. Lombok.

64a (61d). F v11 approximate to v12.

64b (66). H no tuft of hairs base costa.

64 (65). Antennæ long, over ½ costa = cell ; apiculus long, fine and hooked. Hyaline spots F and H.

Scobura, Elwes. N. E. India to Sumatra and Borneo. China.

65 (64). Antennæ short = ½ costa, not so long as cell ; apiculus obtuse, short. May be hyaline spots F.

Suada, DeN. N. E. India to Philippines.

66 (64b). ♂ H tuft of long thin hairs base costa and unf short oblique scales overlying a groove under the basal part of the scv. No hyaline spots ; usually a red band upf.

Koruthaialos, Watson. N. E. India to Philippines. (= *Arunena*, Swin and *Corythæolos*, Mab.)

67a (61c). Palpi 3rd joint very short, blunt, conical. No hyaline spots except in ♀ of *Ge*.

Sancus Group.

67 (68a). F v11 touches v12. Antennæ = ½ costa. ♂ unf with a brown brand under origin of v2. Costa F more arched than usual at base. Above unmarked.

Sancus, DeN. India to Celebes.

68a (67). F v11 close to v12, but not touching it.

68 (69a). Antennæ = ½ costa ; club stout. F v3 just before end cell. Unmarked.

Watsoniella. Bery. N. E. India to Burma. (= *Watsonia*, El. and *Stimula*, DeN).

69a (68). Antennæ = ⅔ costa. F v3 well before end cell. H v2 just after v7.

69 (70). Antennæ with a very long fine hooked apiculus. ♂ upf with a circular patch of recumbent hairs under origin of v2.

Ge, DeN. S. Burma to Java and Borneo.

70 (69). Antennæ with an obtuse apiculus. F broad yellow central band.

Ilma, Swin. (*irvina*, Plotz). Celebes.

71a (61b). F v5 bent down at origin and conspicuously nearer v4 than 6 (except *K. fulgur*). Palpi 3rd joint short, blunt and conical.

Udaspes Group.

71b (73a). F v3 not close to v4, opposite v10 or 11. No hyaline spots. Antennae club slender and gradual.

71 (72). Palpi 2nd joint erect. Unmarked or a red band upf.

Kerana, Dist. N. E. India to Philippines. (= *Tamela*, Swin.).

72 (71). Palpi 2nd joint porrect.

Ancistroides, But. Borneo to Celebes. (*othonias*, Hew and *longicornis*, But.).

73a (71b). F v3 very close to v4 and opposite v9. Large hyaline spots. Antennæ club stout.

73 (74). Antennæ = ½ costa. Palpi porrect. Hyaline spots F and H.

Udaspes, M. India and China to Java.

74 (73). Antennæ more than ½ costa. Palpi erect. Hyaline spots only on F.

Notocrypta. DeN. India and China to Australia. (= *Pleisoneura*, Fd.).

75a (47c). Palpi not protruding, 3rd joint shows as a nipple and the scales round it are flattened and depressed ; 2nd joint very stout, erect and appressed to face. Eyes red. Antennæ club stout, apiculus obtuse, pointed.

Erionota Group.

75b (78a). F apex cell rounded ; v5 straight.

75 (76a). H v2 well before v7. F large hyaline yellow spots. ♂ upf glandular streaks along mid v1 and basal ½ of v2 : unf thick patch of recumbent hairs along v1 ; uph basal ½ of vs 2 and 3 swollen, v2 being shifted to near base.

Gangara, M. India to Philippines.

76a (75). H v7 before v2 unless distorted in ♂ (No. 77).

76 (77). H lower end cell only slightly bent up. F large hyaline spots.

Erionota, Mab. India to New Guinea, China.

77 (76). H lower end cell much bent up in ♀. ♂ unmarked above ; ♀ large yellow hyaline spots F. ♂ upf large patch dense black scales in centre of disc ; unf tuft and H veins swollen as in No. 75.

Paduka, Dist. India to Celebes.

78a (75b). F upper apex of cell acutely produced.

78 (79a). F v5 straight. H v2 opposite v7. Large hyaline yellow spots F and H. ♂ upf a brand along v1.

Pudicitia, DeN. N. E. India.

79a (78). F v5 bent down at origin. H v7 well before v2. Above unmarked.

79 (80). ♂ uph large tuft black hairs attached below v8. Cells very short Antennæ long and slender.

Matapoides, Druce, Borneo. (*smaragdinus*, Druce).

80 (79). ♂ upf brand from mid v1 to below base v3. Antennae = ½ costa, club stout.

Matapa, M. India and China to Moluccas.

81a (47b). Antennæ bent beyond thickest part of club. (*Taractrocera* and *Thymelicus* are aberrant).

81b (97a). Palpi 2nd joint stout, never conspicuously flattened at end, erect or nearly so. Antennæ usually very long and apiculus always well developed, fine, more or less hooked. Usually hyaline spots F.

Pamphilinae, Section II

81c (96). Palpi 3rd joint erect.

81d (85a). F v3 opposite v9.

Hyarotis Group

81e (84). F v4 much nearer v3 than 5. Antennæ over ½ costa.

81f (83). ♂ no alar sex marks.

81 (82). H v7 well before v2. Palpi 3rd joint long, thin and erect.

Oerane, DeN. S. Burma to Philippines.

82 (81). H v7 about opposite v2. Palpi 3rd joint short and stout as in rest of group.

Hyarotis, M. (= *Quedara*, Swin). India to Philippines.

83 (81f). ♂ unf long tuft of hairs on dorsum, partly turned up and partly turned down.

Itys, DeN. N. E. India to Java.

84 (81e). F v4 mid vs 3 and 5. ♂ upf glandular streak along mid v1 and base v2.

Zographetus, DeN. India to Philippines.

85a (81d). F v3 opposite v10 or 11. Antennæ long, over ½ costa.

85b (88a). F v4 not nearer v5 than to v3. (some species of *Plastingia*, *Pirdana* and *Lotongus* are aberrant).

Plastingia Group.

85 (86, 87). ♂ upf dark oval brand above basal ¼ of v1 ; unf a tuft mid dorsum ; uph a tuft of recumbent hairs in 7 from near origin of v8 and tornal cilia elongated.

Isma, Dist. (= *Lophoides*, Watson). Burma to Java and Borneo.

86 (85. 87). ♂ upf may be a stigma mid v1 to base v4 ; an oval brand basal ¼ of v1 ; tornal cilia H elongated. F v5 slightly bent down at origin (straight in *Isma*).

Sepa, DeN. S. Burma to Philippines.

87 (85. 86). ♂ no alar sexmarks. F v5 may be straight or acutely bent down at origin.

Plastingia Group—(*contd.*)

Plastingia, But. India to Celebes. Aru.

88a (85b). F v4 much nearer v5 than 3.

88b (91a). F apex cell not produced and cell not = dorsum.

Lotongus Group.

88c (90). Abdomen below brown.

88 (89). Eyes brown. ♂ no alar sexmarks.

Lotongus, Dist. N. E. India and China to Philippines.

89 (88). Eyes red. ♂ either a seam upf or a brush uph. Tornal cilia orange.

Zela, *DeN.* (= *Zampa*, DeN). N. E. India to Philippines.

90 (88c). Abdomen below white, also cilia H. ♂ unf in one species a large area of black modified scales.

Acerbas, DeN. S. Burma to New Guinea.

91a (88b). F apex cell acutely produced and cell = dorsum.

Unkana Group.

91b (95). Above prominent hyaline spots. Tornal cilia H not orange.

91 (92a). F v2 mid base and v3.

Zea, Dist. S. Burma to Borneo.

92a (91). F v2 much nearer base than v3.

92 (93a). ♂ upf a thin seam from below v2 to base v3 ; unf a tuft mid dorsum. Cilia H white.

Eetion, DeN. S. Burma to Borneo.

93a (92). ♂ no alar Sexmarks.

93 (94). F v5 straight.

Unkana, Dist. Burma to Philippines.

94 (95). F. v5 bent down at origin.

Hidari, Dist. Burma to Borneo and Java.

95 (91b). Above no hyaline spots. Tornal cilia H orange. Below usually green.

Pirdana, Dist. (? = *Biaka*, Joicey and Talbot). N. E. India to New Guinea.

96 (81c). Palpi 3rd joint very long, stout, porrect. ♂ upf obscure glandular streak along middle v2 and uph dorsum clothed long dense hairs.

Creteus Group.

Creteus, DeN. N. E. India. Borneo.

Pamphilinae. Section III.

97a (81b). Palpi 2nd joint more or less flattened at end. Antennæ usually short. F v5 bent down at origin. Eggs generally smooth.

97b (102a). Antennæ with gradual, well formed, slender apiculus, usually hooked. Palpi 2nd joint semi-erect ; 3rd joint short, porrect.

Halpe Group.

97 (98a). F v2 form near base. Antennæ long = ⅔ costa. F v4 nearer 5 and apex of cell produced. Upf from origin v2 basal part of v2 and mv swollen.

Gehenna, Watson. S. Burma to Celebes.

98a (97). F v2 from mid base and end cell, opposite v11 or just before it. Antennæ about ½ costa.

98b (101). H v7 before or opposite v2. F v5 bent down.

98 (99a). Antennæ apiculus very long = length club. ♂ in one spec with a brand in 1 upf and vs 1 and 2 distorted : H vs 6 and 7 hairpinwise.

Pithauria, M. N. E. India and China to Borneo and Java. (= *Pithauriopsis*, W. M.)

99a (98). Antennæ apiculus never as long as the club.

99 (100). ♂ upf usually a brand from mid v1 to v3 and v1 may be distorted ; H vs 6 and 7 hairpinwise, when brand is present upf.

Halpe, M. India and China to Celebes. (= *Thoressa*, Swin.).

100 (99). ♂ uph long tuft recumbent black hairs in 7 from origin v8 ; some glandular scaling about lower edge of cell.

Onryza, Wat. Burma and Siam.

Halpe Group—(*contd.*)

101 (98b). H v2 well before v7 ; cell very short and tornus rounded. F v5 straight. ♂ unf a tuft mid dorsum and uph an oval brand in cell.

Sebastonyma, Wat. N. E. India and Burma.

102a (97b). Antennæ apiculus short, abrupt, very fine and usually upturned at end. (*Taractrocera*, *Thymelicus*, *Eogenes* and *Arrhenes* are aberrant.)

102b (112a). F cell veinlet has no fork to the origin of v3 or 4. Above dark brown and yellow.

Pamphila Group.

102c (104a). Palpi 3rd joint porrect. F v2 mid base and v11. H v2 before v7.

102 (103). Apex cell produced. Antennæ =½ costa ; apiculus short and stout.

Actinor, Wat. N. W. Himalayas.

103 (102). Apex cell rounded. ♂ with a circular pouch in cell uph, whence wax oozes ; mv distorted ; F dorsum bowed, v1 distorted and unf a yellow tuft near base dorsum over a polished area. Antennæ with fine, short apiculus. Larva on dicotyledons. Generally aberrant.

Cupitha, M. India to Philippines.

104a (102c). Palpi 3rd joint erect. F v2 just before v11.

104b (111a). H v7 from much nearer end cell than base and about opposite or after v2.

104c (108). Palpi 3rd joint long and thin.

104 (105a). H no tuft of long thin hairs at base costa and unf no scales from basal part of v12 overlying scv. Antennæ normal. ♂ no brand.

Nicevillea, **nov.** type *gola*. India to Australia.

105a (104). H with a long tuft of thin hairs at base costa and unf obliquely placed scales from basal part of v12 overlying scv.

105 (106a). Antennæ club aberrant consisting of a hollowed disc ; antennae = ½ costa. ♂ may have brand upf.

Taractrocera, But. India and China to Australia. (= *Bibla*, Mab).

106a (105). Antennæ club normal ; length rather over ½ costa.

106 (107). Antennæ apiculus commences well beyond thickest part of club and is very fine throughout. ♂ may have a brand upf.

Padraona, M. India and China to Australia. (= *Ocybadistes*, Heron).

107 (106). Antennæ apiculus commences near thickest part of club and tapers to a point, always obtuse ; club distinctly flattened. Wings much squarer. ♂ usually with a brand upf.

Arrhenes, Mab. Moluccas to Australia. (5 or more species).

108 (104c). Palpi 3rd joint short, stout and conical. ♂ may have a brand upf or a tuft uph.

Telicota, M. India and China to Australia. (= *Corone*, Mab and *Cephrenes*, Waterhouse and Lyell).

109 a (104b). H. v7 from mid base and end cell, before v2. ♂ usually with a brand upf from mid v1 to base v4.

109 (110. 111). Antennæ apiculus = club.

Augiades, Hub. Europe to China. N. India and N. Burma.

110 (109. 111). Antennæ apiculus = ½ width club.

Pamphila, Fab. Europe to N. Asia. N. W. India. N. America. (*Urbicola*, Hub ; *Erynnis*, Auct).

111 (109. 110). Antennæ without apiculus, club blunt.

Thymelicus, Hub. Europe to N. C. and W. Asia. N. Africa and N. America. (8 species). (= *Adopaea*, Billberg and *Pelion*, Kir).

112a (102b). F internal cell veinlet with well marked branch to origin of v3 or 4. Usually dark brown with hyaline spots. F apex cell produced.

Oegenes Group.

112b (114a). Antennæ very long = ⅝ costa. Palpi erect, 3rd joint very short. F v2 mid base and v11.

112 (113). H with a tuft of long thin hairs, base costa and unf scales from basal part v12 obliquely overlying scv. Cilia H white. ♂ upf a small circular brand above v1 or a seam from mid v1 to v3.

Sabera, Swin. New Guinea to Australia. (4 species).

Gegenes Group—(*contd.*)

113 (112). H no tuft thin long hairs, base costa or unf oblique scales overlying scv. ♂ with brand upf.

Mimene, Joicey and Talbot. (= *Mimas*, DeN). Moluccas and New Guinea area. (9 species including *atropatene*, Fr. and *hasoroides*, Elwes).

114a (112b). Antennæ = ½ costa more or less.

114b (117). Palpi erect, 3rd joint short. F v2 just before v11. H lower end cell produced and bent up; v7 before v2.

114c (116). Antennæ apiculus short, but well developed and pointed.

114 (115). F v5 only slightly bent down at origin; v4 mid vs 3 and 5. H cilia white. ♂ in one species unf with a tuft of hairs mid dorsum.

Iton, DeN. N. E. India to Celebes.

115 (114). F v5 acutely bent down at origin; v4 nearer v5. ♂ may have a brush uph and a brand upf; a tuft near base dorsum unf; a discal stigma upf; or no sex marks.

Baoris, M. Africa. Syria. India and China to Australia.

(= *Parnara* and *Chapra*, M; *Caltoris*, Swin; *Polytremis*, Mab; *Milena*, Evans).

116 (114c). Antennæ very short and apiculus minute.

Gegenes, Hub. Africa. S. Europe to N. W. and N. India. (= *Philoodus*, Ramb).

117 (114b). Palpi 3rd joint porrect. Antennæ no apiculus. F v2 nearer base than end cell; v4 mid 3 and 5. H v5 prominent and bent down at origin.

Eogenes, Mab. Asia Minor to C. Asia and Chitral.

Note.—The arrangement of genera is based upon Watson's work and any modifications introduced by De Niceville, Mabille, Elwes, Fruhstorfer, Swinhoe and Bell have been carefully considered. In order to work out the group, I have found it necessary to study the species occurring from Europe to Australia and I have dissected and examined members of nearly every known species. So as to make the key as useful as possible I have included all the genera occurring in the area dealt with. Except perhaps for Central America the Hesperiidae attain a maximum development in the Indian Empire as regards numbers of species and since species new to India are frequently turning up, I have included in the keys species (not races) occurring in Persia, Central Asia, Thibet, S. W. China, Siam, the Malay Peninsular and the Malay Islands. The inclusion of non-Indian species no doubt increases the bulk of these articles somewhat, but renders them useful to a wider class of readers.

The classification of the *Pamphilinae* presents peculiar difficulties; I have divided the subfamily into three sections and each section into a number of small groups. I do not consider that further sub-division into sub-families is justified at the present time.

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For the Hesperiidae of Australia I would refer students to 'The Butterflies of Australia' by Waterhouse and Lyell, 1914. For the Malay Peninsular there is Distant's 'Rhopalocera Malayana,' 1888. For Java there is 'The Rhopalocera of Java' by Piepers and Snellen, 1910. For Sumatra there is 'The Butterflies of Sumatra' by De Niceville and Martin, 1895. There are various old lists of the butterflies of the Philippines, Buru, Ke Islands, etc., but generally speaking the Hesperiidae of the area from Borneo to New Guinea require a great deal more investigation.

I. 1. **Hasora**. The Awls (referring to the shape of the Palpi). (Plate 30).

Above dark brown, usually unmarked in the ♂; ♀ usually with pale yellow hyaline spots F. Below plain, may be purple or green washed and may have a prominent pale band H.

1a (6a). Tegumen with a single pair of horns at the back. ♂ without brand upf.

Myra Group.

1b (5). Unh no prominent pale band.

1c (4). Unh no green wash.

Myra Group—(*contd.*)

1d (3). Unh no dark central band.

1 (2). Tornus H not yellow. Above unmarked ; cilia H fuscous. ♀ uph basal ⅔ clothed yellow hairs. Unh brown, no prominent pale spot over the black tornus. Small with rounded wings.

mus pahanga, **nov**. (45–50). Gunong Tahan, Pahang. Perak. The Plain Awl. (*mus*, Elwes, from Borneo has cilia uph yellow and unh a prominent pale subtormal spot ; paler). R.

2 (1). Uph and unh tornus broadly yellow. ♀ with large hyaline yellow spots upf.

myra ; Hew. (52). Java and Sumatra. The Yellow Awl.

3 (1d). Below dark brown with a dark discal band, paler beyond band. Lobe H insignificant.

α. Below with a slatey glaze ; unh small pale yellow spot end cell and a pale subtornal spot ; the tornus is not dark. ♂ upf usually with one or two minute apical spots. ♀ with prominent apical and discal spots.

lizetta anura, DeN. (45–55). Mussoorie to N. Burma. C. and W. China. N. Siam. The Lobeless Awl. R.

β. Below dark brown with no slatey glaze. Unh no pale cell spot and subtornal patch obscure, but tornus is black. ♂ upf no apical spots.

lizetta lizetta, Plotz. Probably S. Burma. Malay Peninsular, Sumatra, Java, Nias and Sumbawa. (= *hadria*, DeN ; *wortha*, Swin ; *tantra and avajra*, Fruh). R.

4 (1c). Unf apex and costa and all unh washed greenish blue, tornus black and a pale subtornal patch. ♀ upf small pale yellow hyaline spots in cell, 2 and 3.

salanga, Plotz. (50–55). The Green Awl. Dawnas—Malay Peninsular, Nicobars, Sumatra, Java and Borneo. (= *woolletti*, Riley). R.

5 (1b). Unh broad bluish white discal band, outwardly diffuse and broken above black tornal lobe ; washed bluish inside the band. Unf some bluish white scaling end cell and an obscure narrow discal band, curved in at costa. ♀ upf prominent pale yellow discal spots in 2 and 3, which may be traceable as dots unf in ♂. Very like *vitta*.

proxissima, Elwes (45–50). The Scarce-banded Awl. Siam. Borneo. Philippines. VR.

6a (1a). Tegumen with 2 pairs of horns at the back.

6b (9a). ♂ no brand.

Badra Group.

6 (7a). Unh no pale discal band ; a prominent white spot end cell and a pale subtornal spot over the black lobe ; lobe well developed.

α. ♂ below dark ochreous, apex F and disc H broadly pale ochreous ; in ♀ purple washed. ♂ upf no apical dots ; ♀ large yellow spots in cell, 2 and 3 and apical dots 6–8.

badra lanka, **nov**. (50–55). The Common Awl. Ceylon. NR.

β. ♂♀ below strongly purple washed and unf a black area beyond end cell. ♂ upf usually with apical dots.

* *badra badra*, M. S. India, Sikkim to Burma, Andamans. China, Formosa. Malay Peninsular, Sumatra, Java, Borneo to Lombok. C. (= *godama*, *sankarya* and *madatta*, Fruh. In the Philippines, Celebes and Moluccas there occurs a race with much larger spots unh, *quadripunctata*, Mab = *gnaeus*. Pl. and *celebica*, Stg.).

7a (6). Unh with a pale discal band.

7 (8). ♂ above unmarked. ♀ with large white spots in cell, 2 and 3 and apical dots ; bases clothed pale hairs, broadly so on H. Unh dark brown with broad white sharply defined discal band narrowing posteriorly, becoming in ♂ obsolete below v2.

borneensis, Elwes. (60–64). Borneo.

8 (7). Upf always a prominent white apical dot in 6 and rarely also in 7 ; prominent discal spots in 2 and 3 in ♀ and usually a dot in 3 in ♂. Unh obscurely blue washed, a broad bluish white discal band, outwardly diffused and broken subtornally ; tornus black. Unf some obscure bluish white scaling at end cell, apex pale and inner edge of pale area straight, not curved as in *proxissima*, *alexis*, *taminatus*.

Badra Group—(*contd.*)

vitta, But. (45–55). The Plain Banded Awl. Orissa, Sikkim to Burma, S.W. China, Andamans, Siam, Malay Peninsular, Sumatra, Java, Borneo. (=*chabrona*, Pl. *proximata*, Stg., appears to be the race from the Philippines and Celebes).

subcœlestis, Roth, New Guinea ; *umbrina*, Mab=*habroā*, Swin, Celebes ; *discolor*, Fd = *mastusia*, Fr, Moluccas to Australia, belong to this group ; *latifascia*, J and T ; *splendida*, Mab ; *simillima*, Roth are probably conspecific with *discolor*.

9a (6b). ♂ with a brand.

9b (11a). ♂ brand consists of glandular streaks along vs 1, 2 and 3.

Thridas Group.

9 (10). Unh plain brown with a more or less well developed pure white discal band. ♂ upf with pale yellowish white discal spots in 2 and 3 and apical spot in 6.

moestissima coulteri, WM and DeN. (52–60). The Large-banded Awl. Cachar. VR. (races appear to be *palinda*, Swin, Java, Nias and probably Sumatra : *minsona* = *mimosa*, Swin, Borneo ; *pathana*, Fruh, Philippines ; *moestissima*, Mab, Celebes ; ? *boisduvali*, Fd, Moluccas ; *postfasciata*, Roth, New Guinea and *haslia*, Swin, Australia and Dampier).

10 (9). Unh dark brown with a strong violet wash, no white band. ♂ above unmarked ; ♀ ?

leucospila parnia, Fruh. (48–56). The Violet Awl. S. Burma. Malay Peninsular. Nicobars, Sumatra, Java, Borneo. VR. (*matisca*, Fruh Philippines ; *leucospila*, Mab, Celebes ; *violacea*, Elwes, Mouccas).

(*thridas*, BdV. = *ribbei*, Pl, *apara*, Fr, and *chalybeata*, Joicey and Talbot, Moluccas, Waigou, Obi, belongs to this group).

11a (9b). ♂ brand is a continuous seam.

Alexis Group.

11b (14). Uph no yellow band.

11 (12a). Unh no pale band ; dark ochreous brown with a faint purple wash, centrally darker ; obscure pale spot end cell and over tornal lobe. ♀ upf large pale yellow hyaline discal spots in cell, 2 and 3 and apical spots. Very like *badra*.

simplicissima lioneli, Fruh. (44–48). The Simple Awl. Dawnas to S. Burma. Malay Peninsular, Sumatra, Java and Borneo. R. (=*yanuna*, Fruh. Philippine race *mixta*, Mab = *prabha* and *cirta*, Fruh and *philetas* and *certhia*, Plotz. *fenestrata*, Fruh, Celebes. *simplicissima*, Mab, Moluccas).

12a (11). Unh with a prominent pale discal band.

12 (13). Unh discal band bluish or purple white, narrow, outwardly diffused ; wing more or less glossed dull steely blue. ♀ upf prominent white discal spots in 2 and 3 and apical spot in 6 (rarely also in 7).

alexis alexis, Fab. (45–50). The Common-banded Awl. Ceylon, India, Burma, China and Siam to the Celebes. C. (= *chromus*, Cr and *ambasa*, M ; *inermis*, Elwes, Liu Kiu Is. : *vairacana*, Fruh, Formosa ; *canostigma*, Joicey and Talbot, Hainan are probably races. The race flying from the Moluccas to Australia, etc., should probably be called *khoda*, Mab = *ganapata*, Fruh ; *attenuata*, Mab ; *contempta*, Plotz ; *lucescens*, Lucas ; *bilunata* and *atrox*, But).

13 (12). Unh discal band sharply defined and pure white.

α. Unh base dull indigo blue and discal band very broad. Unf apex and unh margin clothed ochreous scales. ♀ upf small white spots in 2 and 3.

taminatus taminatus, Hub. (45–50). The White-banded Awl. Ceylon and S. India. C. (*chromus*, Auct and *butleri*, Aurivill).

β. As last but no ochreous scaling below and unh discal band narrower.

taminatus bharara, Fruh. Sikkim — N. Burma and W. China. NR.

γ. Unh steely blue from base up to the discal band, which is very narrow.

taminatus almea, Swin. S. Burma. Siam and Malay Peninsular to Borneo. NR.

δ. Unh brilliant metallic green ; discal band narrow. ♀ spots upf may be absent or are very small.

Alexis Group—(*contd.*)

* *taminatus malayana.* Fd. Andamans and Nicobars. C. (Felder gives Malacca as the type locality, but his figure exactly represents the Andaman form).

(*padma*, Fruh = *galaca*, Fruh, Philippines. *attenuata*, Stg = *meala*, Swin, Celebes. *amboiensis*, Swin = *acakra*, *pramidha* and *dipama*, Fruh, Moluccas and Waigou).

14 (11b). Uph a broad yellow central band, cilia yellow. Upf conjoined yellow hyaline discal spots in 2, 3 and cell, and apical spots 6–8. Below similar, pale brown basally ; unf more or less purple washed about apex.

* *schonherri schonherri*, Lat. (40–50). The Yellow-banded Awl. R. Assam to Burma, Malay Peninsular and islands to Borneo. (= *chuza*, Hew and *cridatta*, Fruh. The Philippine race is *gentiana*, Fd = *saida*, Hew, with non-hyaline spots upf and the yellow band to the base uph).

(In this group are *celaenus*, Cr = *lugubris*, Bdv and *akshita*, Fruh, Moluccas to Australia and *hurama*, But = *vivapama* and *perplexa*, Fruh, *burgeri*, Ribbe and *dampierensis*, Roth, Celebes to Australia).

I. 2. **Ismene**. The Awlets. Mostly unmarked dark brown above and striped below. (Plate 30).

1a (3a). Unh no striping, veins not pale and no black spot at base 8. Cilia H orange, lengthened tornally. ♂ with a brand upf and v3 nearer 4 than 2.

Ilusca Group.

1 (2). ♂ brand upf broad, edges zigzag, consisting of long and short conjoined streaks. Above bases and most of H clothed orange red hairs. Upf white hyaline spots in 2 and 3 more prominent in ♀, may be absent in ♂. Unh slate.

* *mahintha*, M. (40–45). Assam to Burma. The Slate Awlet. NR.

2 (1). ♂ brand upf narrow. Above mostly orange yellow. Unh narrow pale purple white discal band, extending to F.

nestor, Mosch. (45–50). The Banded Awlet. Java, Flores. R. (= *firdusi*, Pl ; *ionis*, DeN ; *atrinotata*, Mab ; *rubrocincta*, Mab ; *antigone*, Rob ; *zonaras*, Fruh). (Belonging to the group—*aquilina*, Spey = *janskowskii*, Ob and *chrysaeglia*, But, Japan and N. China—*ilusca*, Hew, Celebes).

3a (1a). Unh more or less striped and a prominent black spot at base 8.

3b (10a). Unh striping orange or purple. H cilia orange.

Oedipodea Group.

3c (7a). ♂ upf with a brand and v3 bent down to near v2.

3d (6). ♂ brand consists of black modified scales. ♂ upf basal costal orange streak and unf broadly paler.

3e (5). ♂ brand basal, against mv from v1 to v4 ; large and prominent ; v1 distorted.

3 (4). About 48 mm. expanse.

α. ♂ H v8 somewhat distorted and costa white ; v6 bowed. Unh more or less orange striped ; somewhat prominent orange discal patch beyond cell F and H. No blue hairs on thorax above.

oedipodea ataphus, Watson. (40–50). The Branded Orange Awlet. Ceylon. NR.

β. ♂ H v8 not distorted and v6 only slightly bowed. Unh dorsum more orange. Blue hairs on thorax above.

oedipodea aegina, Plotz. Mussoorie to N. Burma. S.W. China. NR.

γ. ♂ H v6 not distorted and v6 straight. Unf orange discal areas replaced by greenish. Unh pale purplish edged greenish streaks on a pale greenish brown ground.

oedipodea tuckeri, Elwes. Tavoy. VR (? unique).

δ. ♂ H v8 distorted and apex folded over, v6 acutely bowed towards v4. Above prominent blue hairs on thorax and in cell uph. Below orange areas prominent and dorsum H broadly orange.

oedipodea oedipodea, Swainson. Probably S. Burma. Peninsular Siam, Malay Peninsular and Islands to Philippines. NR. (= *consobrina*, Pl and *belesis*, Mab : *athena*, Fruh is Tonkin race).

4 (3). Expanse 58–66 mm. No blue hairs on thorax. ♂ H v8 not distorted and v6 straight ; costa upf brown. Below no orange, pale purple discal patches and streaks between veins H.

Oedipodea Group—(*contd.*)

oedipus, Elwes. The Large Branded Orange Awlet. Perak (F.M.S. Mus). Sula Islands. VR.

5 (3e). ♂ upf brand central from mid v1 to base v4; variable and may be divided into spots; rather obscure and never so dark. Above ♂ plain; ♀ with bluish hairs at base and thorax.

α. ♂ brand restricted to 2 patches on v2 and base v3. Above ♂ prominent basal costal streak on F. Below narrow orange striping, more intense mid disc beyond cells.

jaina fergusonii, DeN. (60–70). The Orange Awlet. S. India to N. Kanara. NR.

β. ♂ brand as in last. ♂ upf basal costal orange streak obscure. unf prominent white spot in cell and a series of dull purple white spots 4–8; rather obscure in ♂.

jaina jaina, M. Mussoorie to Sikkim. NR.

γ. ♂ brand a square patch from just above v1 to v3. As last, but larger and darker.

* *jaina vasundhara*, Fruh. Assam to Karens. NR.

δ. ♂ brand more extensive. Below spots on F more obscure. Upf orange striping more prominent and unh striping purple rather than orange.

jaina margana, Fruh. Dawnas. Siam. R.

(*formosana*, Fruh is the Formosa race).

6 (3d). ♂ upf brand replaced by a dense patch of shining recumbent hairs over lower part of disc from scv to v1. Upf basal costal orange streak prominent. Below striping and pale patches beyond cells pale purple; unf obscure spot in cell.

phul, Mab. (60–65). The Plush Awlet. Perak, Borneo, Philippines and Celebes. VR. (=*tolo*, Pl and *excellens*, Hopf).

7a (3c). ♂ no brand.

7 (8a). ♂ F v3 bent down close to v2. Palpi below grey and orange at sides. Below more or less violet washed and H obscurely striped orange. ♂ upf prominent basal orange costal streak.

anadi, DeN. (50–55). The Plain Orange Awlet. Mussoorie to Karens. Siam. VR.

8a (7). ♂ F v3 nearer v4 than v2 as in all ♀♀.

8 (9). F v4 much nearer v5 than 3, which is opposite v11. ♂ upf very obscure basal orange costal streak; ♀ broadly blue at bases. Below very prominent orange striping and large orange patches beyond cells and at base H.

etelka, Hew. (65–75). The Great Orange Awlet. Karens to S. Burma. Malay Peninsular and Islands (except Java) to Borneo. R.

9 (8). F v4 mid vs 5 and 3, which is opposite v10. ♂ above rather pale brown, lighter below v3 F and costal orange streak obscure; uph costa to v7 white, extending in centre of space 6 to v6. ♀ dark brown, bases and thorax clothed blue hairs. Below evenly orange striped with streaky orange patches beyond cells.

harisa harisa, M. (45–55). The Orange-striped Awlet. Sikkim to Burma. Andamans. C. (Races are—*purpurea*, Riley and Godfrey, E. Siam—*asambha*, Fruh, Tonkin.—*moncada*, Fruh = *distanti*, Swin MS, Malay Peninsular.—*crinatha*, Fruh, Java, Sumatra and Borneo.—*niasana*, Swin, Nias.—*imperialis* Plotz, Celebes). (To the group belong *lysima*, Swin, Ké Is.—*lusca*, Swin, Celebes).

10a (3b). Unh striping green and black, very prominent.

Vasutana Group.

10b (12a). H cilia orange. Below green with narrow black stripes between each vein and veins black.

10 (11). ♂ upf prominent separate brands along vs 1, 2, mv and 3; v3 close to v2. Above dark brown, clothed yellow hairs. Unf no spots.

striata, Hew. (55–65). The Branded Green Awlet. R. W. China (= *septentrionis*, Fd).

11 (10). ♂ no brand and v3 near v4; dark brown, uph clothed orange hairs. ♀ above base and thorax clothed blue hairs. Unf small hyaline or semi-hyaline white spots in 2 and 3.

Vasutana Group—(*contd.*)

vasutana, M. (55–65). The Green Awlet. Kumaon to N. Burma (=*rahita*, Fruh).

12a (10b). H cilia whitish grey. Below black, veins green and a green stripe between each vein.

12 (13). ♂ upf rather obscure brands along vs 1, 2 and 3; v3 near v2. Above ♂ prominent orange costal streak F, more obscure in ♀. Below uniform, stripes bluish green.

amara, M. (45–55). The Small Green Awlet. Sikkim—S. Shan States, Andamans. (= *pindapatra*, Fruh). NR.

13 (12). ♂ upf no brand and v3 close to v4. ♂ above rather pale brown with pale yellowish streaks between veins and uph costa broadly pale as in *harisa*. ♀ purple brown, base F and nearly all H green. Below paler, striped pale green; unh broad pale streak from base through cell to termen.

α. ♂ above pale striping much more developed; ♀ pale diffuse spots upf in 2 and 3. Smaller.

gomata kanara, nov. (50–55). The Pale Green Awlet. N. Kanara, S. India. R.

β. Larger and darker.

* *gomata gomata*, M. (60–65). Sikkim to Assam. R.

(Races are—*lara*, Leech, China.—*lalita*, Fruh, Malay Peninsular, Sumatra, Borneo.—*vajra*, Fruh, Java.—*lorquini*, Mab = *mindorana*, Fruh, Philippines. —*radiosa*, Pl, Celebes).

(*hemixanthus*, Roth, New Guinea, belongs to this group).

I. 3. Bibasis. The Orange-tail Awl. (Plate 30).

Above unmarked. Cilia H and end abdomen orange. Unf large white central patch above mid dorsum. Unh broad white discal band with diffused edges.

* *sena sena*, M. (45–50). Ceylon. S. India. Mussoorie to Burma. Andamans. Siam and Malay Peninsular. NR. (races are—*uniformis*, El, Sumatra, Java, Borneo, Bawean and Lombok—*sumbawana* El, Sumbawa—*palawana*, Stg = *vaicravana*, Fruh, Philippines and doubtfully Celebes).

I. 5. Rhopalocampta. The Awlking. (Plate 30).

Above bluish purple brown, more or less overlaid basally with dark greenish hairs (bluish in ♀). Below green with narrow black veins. H tornus and cilia orange.

α. Uph tornal end dorsum and cilia orange. Unh tornus black broadly and irregularly surrounded orange.

* *benjaminii*, *benjaminii*, Guer (50–55). Ceylon. S. India. Simla to Karens. China. NR. (= *xanthropogon*, Koll. Allied races are *japonica*, Murray, Japan — *formosana*, Fruh, Formosa. The genitalia of the Ceylon form are distinct and 3 very distinct types of genitalia are to be found in Assam; in Mussoorie and again in Java the larva has been found to be dimorphic).

β. Lemon yellow at tornus instead of orange and the yellow area uph and unh much more extensive.

benjaminii crawfurdi, Dist. S. Burma, Malay Peninsular, Sumatra, Nias, Borneo. (*subcaudata*, Fd. with the tornal yellow still more extensive is the race in Java, Bali and Banka. In the Celebes *benjaminii* is replaced by *plateni*, Stg = *renidens*, Man with race *adhara*, Fruh in the Philippines. *iluensis*, Ribbe occurs in the Moluccas with race *ornatus*, Roth in New Guinea).

I. 6. Badamia. The Brown Awl. (Plate 30).

Above dark brown, bases prominently paler. Upf ♂ with whitish hyaline spots in cell 2 and 3; in ♀ spots are larger, spot in 2 is conjoined to cell spot and there is a small spot in 1 against v1. Below pale brown, tornus H dark brown, crowned by a whitish spot.

* *exclamationis*. Fab. (50–55). All India and China to Australia. Ceylon, Andamans and Nicobars. C. (= *ericus*. F; *thymbron*, Fd; *ladon*, Cr; *forulus*, Hub).

I. 10. Orthopaetus. The Dawnflies. (Referring to their habit of flying at dawn). (Plate 30).

I. 10. **Orthopaetus**—(*contd.*)

Large ferruginous brown insects. Upf prominent white hyaline spots in cell 2 and 3 and more or less prominent apical spots. Uph a discal row of dark spots.

1 (2a) Uph discal spots large, black, yellow ringed. Above fulvous brown. ♂ upf with a costal fold.

lidderdali, Elwes, (65). Lidderdale's Dawnfly. Bhutan. VR (? unique). (Race *melli*, Hering, Tsha-jiu-san, China).

2a (1). Uph discal spots small and a dark spot end cell; in ♀ some of the spots may be hyaline white. Upf apical spots obscure and dark in the ♂; prominent and hyaline in ♀.

2 (3). ♂ with costal fold upf. ♂ above fulvous brown; ♀ dark ferruginous brown.

**lalita*, Doh, The Fulvous Dawnfly. Lushai, Assam to Burma, Siam. R.

3 (2). ♂ no costal fold. Above rich dark fulvous brown.

phanaeus, Hew. (60–65). The Dark Fulvous Dawnfly. R. Malay Peninsular, Sumatra, Borneo and very probably S. Burma.

I. 11. **Capila.** The Striped Dawnflies. (Plate 30.)

Large dark brown insects, more or less striped in the ♂ and with a white band upf in ♀, usually.

1 (2a). Upf prominent hyaline white spots in cell, 2 and 3; small spot in 1 just below spot in 2; prominent apical spots in 6–8. Above olive brown. Uph obscure black veins and spots in 2 and 3. H square, angled at apex and v3.

omeia, Leech. (60). The Olive Dawnfly. W. China. R.

2a (1). Upf at most a single spot in ♂ and ♀ with a continuous hyaline white band; no apical spots.

2 (3a) ♂ upf single large hyaline white spot end cell; bases and thorax fulvous; apex F produced and outer margin straight. ♀ upf an irregular white band from mid costa to tornus, as in *zennara*, but inner edge of spot in 2 very irregular and reaches to inner edge of spot in 3; purple basal suffusion. Antennæ longer than usual.

* *mackwoodi*. Evans (70). Mackwood's Dawnfly. N. Shan States to Karens. S. E. Siam. (= *barroni*, Riley and Godfrey). VR.

3a (2). ♂ upf no hyaline spot.

3a (5). ♂ above uniform dark brown, with prominent pale stripes between veins.

3 (4). ♂ above uniform, rather pale brown, head, etc., dark brown; termen convex. ♀ upf discal band very irregular; uph no pale stripes.

zennara, M. (65–80). Sikkim. VR. The Pale Striped Dawnfly. (Race *hainana*, Crowley, Hainan).

4 (3). ♂ above base, head and thorax orange. ♀ upf central white band regular with parallel edges; uph dull pale stripes outwardly. ♂ apex F produced and margin straight.

* *jayadeva*, M. (65–75). The Striped Dawnfly. Sikkim to Assam. R. (Race *pussa*, Hering, China; only ♀ described and is likely to prove to be the ♀ of *translucida*).

5 (3a). ♂ above olive brown, discs broadly pale with black veins; margin and base broadly dark.

translucida, Leech. (68). The Chinese Dawnfly. VR. W. China.

I. 12. **Crossiura.** The Fringed Dawnfly.

♂♀ above very dark brown; upf shining white hyaline band from scv across cell to 1 with small spot beyond; in ♀ band is continuous from costa to dorsum at tornus; 5 small apical spots from 4–8. Uph in ♀ a discal series of small dark spots, with diffuse fulvous rings.

pennicillatum, DeN. (60–70). Khasi Hills. VR. (races—*kiyila*, Fruh, C. China—*insularis*, Joicey and Talbot, Hainan).

I. 13. **Calliana.** The White Dawnfly. (Plate 30).

♂ above white; upf with broad dark brown apex and dark marginal spots in 2 and 3; uph with one or more black discal spots showing from below. Unf basal ⅔ cell and costa dark brown and a similar patch beyond cell; apex as above but dark brown to tornus; unh a discal series of large black spots, also a spot end cell and at bases 1 and 8. ♀ quite different; above dark brown

I. 13. Calliana.—(*contd.*)

with upf a very large hyaline white spot end cell, continued as a non-hyaline spot to the costa, also large hyaline discal spots in 2 and 3; uph with small black discal spots; unh black spots as in ♂.

* ***pieridoides***, M. (60–70). Assam. Dawnas. W. China. R. (race ***adamsi***, **nov**; larger, more heavily marked and the cell upf black dusted, Borneo—3 ♂ in Adams collection, B.M.—1 ♂ Selangor Pahang border, 'The Gap.' F. M. S. Mus).

I. 15. Charmion. The Velvet Flat. (Plate 30).

♂ above velvet black; ♀ browner. Upf broad white hyaline band with bluish reflections from v2 to scv; at end cell in ♂ band is constricted at upper end, in ♀ even, but nicked at v4. Palpi brown below, orange at sides. Antennæ plain black.

* ***ficulnea***, Hew. (45–50). S. Burma, Malay Peninsular, Siam, Sumatra, Borneo NR. (= ***signata***, Druce; ***leucographa***, Pl; ***queda***, Pl. Races are—***niasica***, Mab = ***ovalis***, Mab, Nias—***tola***, Hew = ***zawi***, Pl and ***pleisoneura***, Stg, Celebes. Not recorded from Java or Philippines).

I. 16. Celaenorrhinus. The Flats. (Plate 30).

Above dark brown. Upf with a hyaline white or yellow discal band from scv at end cell to at least v2, composed of conjoined or detached spots; also usually 5 apical spots in 4–8. Uph and unh often with non-hyaline yellow spots. (♂ of ***spilothyrus*** is aberrant, having no discal markings upf).

1a (21a). Upf hyaline spots not coalesced spot in 3 not reaching base 3 (except individuals of *munda and saturatus*). Uph and unh usually with orange spots and cillia prominently chequered. Upf hyaline spots white, except *saturatus* and *snelleni*.

1b (4a). Unf 4 outer spots in 1, the outer two being distinct non-hyaline white spots. Antennæ white banded below club. Uph yellow spots small.

Ambareesa Group.

1c (3). Upf and unf prominent spot in 1 before middle. Cilia F chequered.

1 (2). Uph basal spots and spot end cell obscure and dusky; discal spots small and usually prominent Upf cell spot continued to costa.

ambareesa, M. (45–55). The Malabar Flat. S. India—Bengal. NR.

2 (1). Uph spot end cell large and prominent, other spots small. Upf cell spot not continued to costa.

consanguinea, Leech. (43–47). The Mupin Flat. W. China. R. (race *ratna*, Fruh, Formosa).

3 (1c). Upf there may be a minute spot before middle in 1, but it is not reproduced unf. Uph spot end cell and discal spots prominent.

pyrrha, DeN. (45–55). The double spotted flat. Bhutan and Kumaon to N. Burma. NR.

4a (1b). Unf only 2 or fewer outer spots in 1, but there may be some white suffusion between these spots and the margin. Upf cilia not chequered.

4b (9a) Upf and unf a pale spot before the middle in 1. (May be present in individuals of *munda*).

Pulomaya Group.

4c (7a). Unh no yellow basal streaks.

4 (5a). Antennæ shaft white above in the ♂. Cilia H pale yellow, unchequered. Upf spots small and few.

pero, DeN. (50–60). The Mussoorie Spotted Flat. Mussoorie to N. Burma. R.

5a (4). Antennæ ♂ ♀ white banded below club. Cilia H prominently chequered. Uph spots large and numerous.

5 (6). Upf central and lower discal spot in 1 small and rounded. Palpi yellow and brown below. Apex F produced. Apex of tegumen undivided, but surmounted by 2 long curve spines; clasp undivided.

* ***pulomaya***, M. (45–50). The Multi-spotted Flat. Kangra to Nagas. W. China. NR. (= ***pila***, Tytler and ***lucifera***, Leech).

6 (5). Upf central and lower discal spot in 1 large, yellow, irregular, as rge as the upper discal spot in 1. Palpi yellow below. Apex F rounded,

Pulomaya Group—(*contd.*)

termen convex. Tegumen divided at apex into 2 broad points, no spines; clasp divided.

tytleri, **nov.** (45–50). Tytler's Multi-spotted Flat. Mussoorie to Manipur. R.

7a (4c). Unh with basal yellow streaks. Uph spots prominent.

7 (8). Unh double spot mid cell. Antennæ white banded below club. Uph spots prominent.

maculosa, Fd. (45–50). The Streaked Flat. C and W. China, Szechuan. C.

8 (7). Unh single spot mid cell. ♂ Antennæ whitish in front. Apex F produced. Larger.

aspersa, Leech. (60). The Large-streaked Flat. Nagas. Chia-kou-Ho, China. VR. (= *clitus*, DeN).

9a (4b). Upf and unf no spot before the middle of 1 (except individuals of *munda*); in *flavocincta* there is a dark spot.

9b (13a). Uph postdiscal spots large and prominent; spots in 2, 3 and 6 always larger than those in 1, 4 and 5.

Sumitra Group.

9 (10a). Above bases ochreous brown and unh except for the brown margin entirely orange with large brown spots. Antennæ shaft white above in ♂.

flavocincta, DeN. (70). The Bhutan Flat. Bhutan. VR.

10a (9). Above and below uniform dark brown.

10 (11a). Unf cell spot not produced to costa. Antennæ Shaft white above in ♂. Uph cilia broad orange, only faintly brown at ends veins. Upf 1 or 2 spots in 1, spot in 3 minute or absent.

* *patula*, DeN (55–65). The Large-spotted Flat. Bhutan, Sikkim to Nagas. R.

11a (10). Unf cell spot to costa. Uph cilia prominently chequered.

11 (12). Uph only a faint spot end cell and postdiscal series of spots; unh no basal spots. Antennæ shaft white above in ♂. Upf single spot in 1.

sumitra, M. (60–65). Moore's Spotted Flat. Sikkim to Assam. VR.

12 (11). Uph prominent spot and cell end unh with prominent basal spots. Upf 2 spots in 1. Antennae white banded below club and shaft white chequered.

plagifera, DeN. (50–60). DeNiceville's Spotted Flat. Sikkim to Assam W. China. NR. (= *pluscula*, Leech).

13a (9b). Uph orange spots small or absent.

13b (18a). Upf spot in 2 extends well behind origin of v3; its inner edge well behind centre of cell spot.

Leucocera Group.

13c (15a). Antennæ club white above and in ♂ shaft as well; ♀ shaft plain, not chequered. Uph usually at least traces of a spot end cell.

13 (14). Apex F not produced; termen not so long as dorsum.

α. Uph cilia chequered pale yellow and brown; postdiscal spots prominent or absent. Upf spot in 3 quadrate, linear or absent; 1 or 2 spots in 2; cell spot may or may not be prolonged to costa. Very variable, but it seems impossible to define local races.

leucocera leucocera, Koll. (45–55). The Common Spotted Flat. S. India to Bengal. Murree to Burma. Peninsular Siam and Malay Peninsular. C. (= *leucocirca*, El and *putra*, M).

β. Uph cilia chequered bright orange and brown; postdiscal spots prominent bright orange.

leucocera chinensis, Swin. W. China. (This is Leech's *sumitra* and is very like *plagifera*, but the antennæ and genitalia are quite different.

γ. Above very black. Cilia H entirely dark brown. Upf apical spots small and separate, no spots in 4 and 5 or 3, nor does cell spot extend to costa; only one spot in 1. Uph unmarked. Variable.

leucocera brahmaputra, El. Sumatra, Java, Bali and Borneo.

14 (13). Apex F produced; termen = dorsum. ♂ upf spots reduced, no spot in 1 (♀ 2). Uph cilia unchequered (in ♀ faintly chequered) yellow. Antennæ the club only is white in the ♂; in ♀ also upper half of shaft.

simula, Hew. (55–60). The Narrow Spotted Flat. Sumatra and Java. (= *angustipennis*, El and *binotatus*, Fruh).

Leucocera Group—(*contd.*)

15a (13c). Antennæ lower part of club white or yellow, shaft white spotted inside. Uph unmarked.

15b (17). Upf spots white. Cilia very prominently chequered pale yellow and brown.

15 (16). Upf spot in 3 conjoined to spot in 2 and to cell spot, usually filling base of cell 3, but may leave a tiny brown triangular spot. Upf apical spots conjoined, 2 equal spots in 1 conjoined upf. Unh only yellow bar end cell. Upf cell spot extends to costa.

munda, M. (45–50). The Himalayan Spotted Flat. Murree to Sikkim. S. Shan States. NR.

16 (15). Upf and unf spot in 3 detached; apical spots separate. Unf lower spot in 1 narrow, vertical, quite separate from lower spot. Unh small yellow spots.

maculicornis, El (45–50). Elwes' Spotted Flat. Assam to Manipur. Siam. (= *vitruvius*, Fruh; race *formosanus*, Fruh, Formosa). R.

17 (15b). Upf spots deep yellow and spot in 3 conjoined as in *munda*. Above clothed dark ochreous hairs. Unh obscure suffused ochreous spots. Cilia dark brown.

saturatus, El. (45–50). The Yellow-spotted Flat. Java, Bali, C.

18a (13b). Upf. spot in 3 does not extend behind origin of vein 3, its inner edge under centre of cell spot; costal spot above cell spot usually yellow. Uph usually large obscure dark spots and unh small diffused orange spots. Unf pale diffused patch in 1 between discal spots and termen.

Spilothyrus Group.

18 (19a). Uph cilia plain dark brown, Antennæ plain, ochreous under club. ♀ with normal spotting; upf 2 spots in 1. ♂ abnormal; above velvet black; upf unspotted or at most 3 golden apical spots and a small upper spot in cell under origin of v11 with a spot on the costa above it and a small conjoined outer spot below it.

spilothyrus, Fd. (40–50). The Black Flat. Ceylon. (= *infernus*, Fd.) C.

19a (18). Uph cilia chequered. Upf at most upper spot in 1.

19 (20). Antennæ club white and shaft white spotted.

α. Uph obscurelarge black spots; unh obscure small orange spots.

ruficornis area, Plotz. (45–50). The Tamil Spotted Flat. S. India to Bengal. NR. (= *fusca*, Hampson).

β. Much blacker. Uph and unh plain except for yellow bar end cell unh.

ruficornis ruficornis, Mab. Java. Celebes. (= *piepersi*, Fruh.).

20 (19). Antennæ base club white above and shaft whitish in ♂, no white spotting. Upf spot in 2 large and outwardly more oblique than usual, lower outer edge midway between termen and inner edge. Upf markings pale yellow in ♂, white in ♀. Uph large dark diffused spots and unh small diffused yellow spots. Upf apical spots in line and coalesced.

α. Upf with spots in 4, 5 and upper dot in 1.

snelleni sema, **nov.** (45). Java. R.

β. Upf spots in 4, 5 and 1 absent.

snalleni snelleni, Fruh. Celebes. (= ? *trimaculata*, Roth, Dampier).

21a (1b). Upf discal band compact and confluent, spot in 3 always to base cell 3.

21b (25a). Upf discal band white or (*tibetana*) very pale yellow.

Tibetana Group.

21 (22a). Upf discal band does not extend into 1 and only in ♀ to costa; rarely a spot in 4 and never in 5 Uph obscure large dark spots in ♂. Unf diffused tornal patch. Unh plain. Cilia and antennæ plain, dark.

α. ♂ unf very narrow costal spot over cell spot; paler. ♀ pale brown and upf cell spot extends to costa.

asmara consertus, DeN (35–45). The White-banded Flat. Assam to Karens. NR.

β. Similar but apex F produced.

asmara cacus, DeN. Rangoon. NR.

γ. ♂ unf costal spot prolonged full width to costa. ♀ upf cell spot not extended to costa. Darker.

Tibetana Group—(*contd.*)

* *asmara asmara*, But. S. Burma, Malay Peninsular, Borneo. NR. (Races of rather doubtful value are—*goto*, Mab, ' Japan ' or more probably Liu Kiu Islands or S. China—*aditta*, Fruh, Siam—*ayata*, Fruh Sumatra,—*milinda*, Fruh, Java—*palajava*, Stg, Philippines).

22a (21). Upf discal band always extending into 1.

22 (23a). Upf discal band not extending to costa above cell; narrow, reaches v1; apical spots 4, 5, 6–8 prominent. H cilia uniform yellow white. Unf no subtornal pale patch. Unh yellow bar end cell. Antennæ white banded below club.

badia, Hew. (55–60). The Scarce Banded Flat. Sikkim to Assam. VR.

23a (22). Upf discal band extending to costa. Antennæ club whitish below. H cilia always more or less chequered white and brown, especially at apex.

23 (24). Upf discal band pale yellow and extended to v1; usually spots in 4 and 5. Unf no subtornal pale patch. Unh unmarked.

tibetana, Mab. (45–55). The Thibet Flat. W. China. Mishmi Hills. Mt. Victoria, S. Chin Hills. (Race *latifascia*, Mab, Yunnan, band much wider). R.

24 (23). Upf discal band white, not reaching v1, only a small upper spot in 1 against outer edge of spot in 2; lower apical spot in 6 out of line, detached and nearer termen. Unf prominent subtornal pale patch. Unh obscure small pale yellow spots.

α. Upf discal band narrow, spot in 3 projects beyond band.

nigricans nigricans, DeN. (40–45). The Small-banded Flat. Sikkim to S. Burma. Malay Peninsular. W. Siam. NR.

β. Upf discal band very wide, spot in 3 not projecting. H cilia with only traces of white about apex. Darker.

nigricans balukinus, El. Borneo. (= *anoma*, Fruh; *orbiferus*, El, apparently an aberration towards *nigricans*).

25a (21b). Upf discal band bright yellow or orange. Antennæ more or less ochreous below club.

Dhanada Group.

25 (26a). Upf discal band less oblique, inner edge directed to dorsum before tornus; lower inner edge of spot in 2 immediately under origin v3, which is at about middle of cell spot. Antennæ always chequered at base. Upf discal band irregular, from costa to mid 1, costal spot non-hyaline; spot in 1 triangular, against outer half of spot in 2; apical spots 6–8 prominent, rarely spots in 4 and 5. Uph obscure large dark spots. Unf suffused subtornal patch, usually conjoined to hyaline spot in 1. Unh traces of small yellow spots, especially end cell and in 1 and 2.

α. Band rather pale golden yellow. Upf no lower spot in 1. H cilia prominently chequered.

dhanada dhanada, M. (40–45). The Himalayan Yellow-banded Flat. Mussorie to Assam. R.

β. Band rather darker. Upf always lower outer tornal non-hyaline spot in 1, conjoined to the hyaline spot. Cilia at least more or less chequered at apex H.

dhanada affinis, Elwes. Assam to Burma. NR. (= *zea*, Swin, an aberration from Assam with upf the apical spots irregular and the spot in 1 against the middle of the spot in 2).

γ. As *affinis*, but much smaller and upf no non-hyaline spot in 1.

dhanada andamanica, WM and DeN. (35–40). Andamans. R.

δ. Band orange, much wider. Upf there may be a small diffused non-hyaline lower spot in 1, but not conjoined to the hyaline spot; the upper spot in 1 has a more or less prominent tooth on its inner lower edge. Cilia dark brown, not chequered.

η. *dhanada dentatus*, El. (40–45). Borneo (= *lativittus*, El.).

26a (25). Upf discal band more oblique and inner edge directed to tornus; lower inner edge of spot in 2 well forward of origin of v3, which is well behind centre of cell spot. Cilia unchequered. Upf discal band extends to the tornus from the costa. Antennæ and cilia plain.

26 (27a). Upf portion of band in 1 and at costa non-hyaline.

α. Band golden, non-hyaline portions orange; apical spots prominent; inner edge spot in 1 against middle of spot in 2. Uph and unh a more or less prominent pale spot end cell.

Dhanada Group—(*contd.*)

* *aurivittata aurivittata*, M. (40–45). The Dark Yellow-banded Flat. Assam to Mergui. NR.

β. Band orange throughout. Smaller.

aurivittata cameroni, Dist. (35–40). S. Mergui, Malay Peninsular. Sumatra. R.

γ. Apical spots minute or absent; inner spots 1 and 2 upf in line. Uph and unh plain.

aurivittata vimana, Fruh. Borneo.

27a (26). Band hyaline throughout. Uph plain.

27 (28). Upf band very irregular, not extending to end cell, spot in 1 against outer half of spot in 2.

inaequalis, El. (45–50). The unequal banded Flat. Java, Sumatra, Borneo. (= *sumatranus*, Mab).

28 (27). Band very broad and regular, extending well beyond end cell; inner edge straight, outer edge posteriorly curved. No apical spots.

ladana, But. (45–50). The Broad-banded Flat. Borneo, Perak.

(*crona*, Hew and *batchianus*, El from Batchian in the Moluccas belong to this group. *editus*, Plotz=*stotharti*. Roth, from New Guinea and Aru constitutes a group by itself. I have been unable to place the following—*mahala*, Fruh, loc? — *clio*, Mab, Formosa—*kiku*, Hering, China.

I. 18. Achalarus. The Marbled Flats. (Plate 30).

Above dark brown with white or yellow hyaline discal spots upf in 1, 2, 3, end cell and costa; apical spots in 4, 5, 6–8. Unf apex and all unh grey powdered in patches, leaving more or less obscure irregular large dark spots.

1a (3a). Upf hyaline spot in 3 touching spot in 2.

1 (2). Palpi black below. Antennæ and cilia not chequered. Upf apical spots 6–8 coalesced.

simplex, Leech. (46). The Black Marbled Flat. W. China. (= *gener*, Ob).

2 (1). Palpi grey below.

α. Paler brown. Apex F less produced and termen convex. Spots white.

bifasciatus casyapa, M. (45–55). The Marbled Flat. Kashmir to Kumaon. R.

β. Darker. Upf band much broader and yellowish.

* *bifasciatus liliana*, Atk. Assam to Karens. Yunnan. C.

γ. Still darker. Bands quite yellow; spots in 4 and 5 faint.

bifasciatus aborica. Tyt. Abor Hills. VR.

δ. Upf spot in 3 not to base 3 as in Indian races.

bifasciatus bifasciatus, Br. and Gr. N. C. and W. China. (*contractus*, Leech Washan and Wa-asu-kow, spots smaller).

3a (1a). Upf spot in 3 quite detached from spot in 2.

3b (5). Upf apical spots 4–8 not conjoined in a curve.

3 (4). Unh black spots prominent and detached. H more rounded than in rest.

proximus, Leech. (45). The Grey Marbled Flat. W. China. (= *frater*, Ob, Yunnan).

4 (3). Unh black spots obscure and coalesced.

nepos, Ob. (47). The Dusky Marbled Flat. W. China.

5 (3b). Upf apical spots 4–8 conjoined on a curve. Unh black spots more distinct than usual.

germanus, Ob. (48). The Curved Marbled Flat. W. China.

I. 19. Satarupa. The White Flats. (Plate 30).

Dark brown with hyaline spots on F and uph a broad white discal area outwardly bordered by black spots.

(12). Palpi below yellow. Upf spot in cell (may be reduced to a small upper spot) 2 spots in 1, large spots in 2 and 3, dots towards margin in 4 and 5 (may be absent), prominent apical spots in 6–8. Uph cilia white chequered. Abdomen white, black tipped.

α. Upf. no whitish scaling at margin near tornus. Uph white area narrow, ⅓ wing black; discal spots coalesced to a broad band and only separated from the broad sub-marginal dark band by a shadowy bluish line. Unh detached spots in 6 and outer and inner spots in 7.

I. 19. Satarupa—(*contd.*)

gopala nymphalis, Speyer. (65–70). The Large White Flat. Amur—W. China.

β. Upf usually with whitish submarginal scaling most prominent as a streak on dorsum under spot in 1 and 2 spots in 1. Uph ⅔ white, postdiscal series of detached black spots separated from the submarginal band by a bluish band. Unf 2 prominent spots in 1 exterior to the discal spots and traces of submarginal spots towards the apex. Unh usually an inner spot in 7, mid 7. Varieties are not infrequent, which show a transition to *nymphalis* on uph and unf the submarginal spots may be replaced by a bluish band.

* *gopala gopala*, M. Sikkim to N. Burma. NR. (*zulla* and *splendens*. Tyt, Nagas are aberrations. Possibly good races are *tonkiniana* and *majasra*, Fruh, Tonkin and Formosa respectively).

2 (1). Palpi white below. Upf no spot in cell ; usually single spot in 1 and a spot in 2 just above it, prominent spots in 4 and 5 directed to apex, curved row of apical dots in 5, 6, 7 and sometimes a dot above in 8.

α. Abdomen above white with brown tip. Paler. Upf discal spots large and a broad white streak on dorsum under spot in 1. Uph white area broad, ⅔ wing, black postdiscal spots prominent, against a narrow submarginal band, cilia white chequered. Unh inner spot in 7 near base, outer spot in 7 nearer spot in 6 ; base bluish. Clasp with single lower spine, top flat with an upper spine.

sambara dohertyi, Wat. (40–50). The White Flat. Mussoorie to Kumaon. NR.

β. Abdomen above inner ½ white, outer ½ black. Darker. Upf discal spots smaller and only traces of the dorsal streak. Uph ⅓ white, black spots discal and merged with the very broad dark border. Unh base brownish, spots prominent, outer spot in 7 mid spot in 6 and inner spot in 7. Clasp with 2 lower spines ; top pointed and long.

sambara sambara, M. Sikkim to Assam. NR. (=*cosima*, Pl, and *indosinica* Fruh, Tonkin).

γ. Abdomen brown with narrow white rings. Upf as *sambara* ; uph and unh as *dohertyi*, but the black post discal spots lie more on the dark margin and base unh is white. Clasp ? Larger.

sambara strigata, **nov**. Karens, Dawnas. VR. (fig. in Lep Ind as *kirmana*).

δ. Abdomen brown. Dark. Upf spots small, spot in 1 as 2 dots, spots in 3 and 4 more detached from spot in 2. Uph white area = ½ wing, black spots on the dark margin and are postdiscal as in *dohertyi* and *strigata*. Unh with blue basal suffusion and outer spot in 7 nearer spot in 6. Clasp with single lower spine as in *dohertyi*, but top is rather different.

sambara affinis, Druce. Malay Peninsular, Borneo. (= *kirmana*, Plotz and *cognata*, Dist. The above description applies to Malayan specimens ; possibly the Bornean *affinis* is a different race).

η. Abdomen brown. Upf spots narrow and linear ; apical spot in 8. Uph as *sambara*, but white area is broader and pure white. Unh outer spot in 7 mid spot in 6 and inner spot in 7. Clasp very like *sambara*.

sambara niphates, Weymer. Sumatra, Nias.

ζ. Abdomen brown. As *affinis*, but white area broader uph. Clasp with single lower and elongated upper spine.

sambara javanensis, Fruh, Java.

ε. Abdomen brown. Upf spots pale yellow, 2 spots in 1 and apical spot in 8. Uph entirely dark brown, faint traces of discal spots. Clasp as *dohertyi* but lower spine longer.

sambara formosana, Matsum. Formosa.

(This species presents an interesting study in variation and more material is required to decide whether there is more than one species).

I. 20. Tagiades. The White Flats. (Plate 30).

Normally dark brown with small hyaline spots F ; uph plain or more usually with a white tornal area ; unh mostly white.

1a (6a). Upf no hyaline spot in 11 over cell spot. The development of the white spots upf is very variable ; the maximum is 2 (or single conjoined) spots in cell, discal spots in 2 and 3, very irregular apical dots in 4, 5, 6–8 ; the spots rest on a more or less obscure black Y-shaped band, rising from mid v1 and

I. 20. Tagiades—(*contd.*)

there is a black spot before the middle in 1. Uph more or less obscure black spots in 2, 3 (usually absent), double spot in 4–5 and spot in 6 ; unh these spots are repeated.

Atticus Group.

1 (2a). Uph no trace whatever of white or bluish suffusion on wing or cilia.

α. Comparatively large. Above rather pale brown, outwardly broadly paler ; dark markings obscure ; discal spots upf well developed, usually no cell spots or spots in 4 and 5. Unf usually with suffused bluish white area at tornus and a smaller area at apex. Unh suffused bluish white usually over the whole wing, except costa, but extent variable ; discal black spots in 4–5 and 6 present or absent. Wings rather angular, but dorsum F is comparatively long.

atticus khasiana, M. (35–50). The Common Snow Flat. Central Prov to Bengal, Dun to Tavoy. Siam C (=*epicharmus*, Fr).

β. Smaller, darker, more uniform, dark markings prominent and hyaline spots on disc F smaller. Unh pale to dark brown, may be no trace of blue white suffusion or a good deal from base, black spots variable.

atticus atticus, F. Tavoy to Malay Peninsular. Pulocondor, Sumatra, Nias. C. (=*ravi*, M ; *lugens*, Mab ; *utanus*, Plotz ; *yotissa*, Fruh. *ravi* was described from Bengal, but the B. M. type is marked Penang, whence it probably came).

γ. Above as *atticus*, but discal spots upf better developed. Unh typically (*helferi*) pure white except for broad brown costa and narrow termen, prominent spots in 4–5 and 6 ; but may be (*ravina*) plain brown.

atticus helferi, Fd. Andamans and Nicobars. NR. (=*ravina*, Fr).

δ. Large dark form with well-developed markings, below variable as *helferi*.

atticus rajaghra, Fruh. Borneo. (=*balana* Fr and *noctis*, El nom nud).

2a (1). Uph tornus or cilia white or at least some traces of blue white suffusion.

2b (5). Upf no spots in cell and usually no discal spots or spots in 4 and 5.

2 (3a). Unh white area at tornus unmarked on termen. Small. Uph narrow pure white tornal area.

lavata, But. (40–45). The Scarce Snow Flat. S. Burma to Malay Peninsular, Sumatra and Natuna. (*albovittata*, M, is the Bornean race). VR.

3a (2). Unh termen before tornus always with spots or a broad line.

3 (4). Uph broad pure white tornal area, bearing 2 or more large brown spots on termen. H distinctly excavated above v4. Apex F and tornus H produced.

α. Large. Uph white area broader, black spots thereon at end vs 4, 3, 2 (largest) and also in ♀ at v1. Upf hyaline spots only at apex in 6–8.

gana gana, M. (50–55). The Large Snow Flat. Sikkim to Karens, Cambodia. NR.

β. Rather smaller. Uph white area narrower and no dark spot at end of v4.

gana menanto, Plotz. Dawnas to S. Burma and Malay Peninsular, Sumatra, Nias, Java and Borneo. (=*elongata*, and *niasana*, Mab ; *avala*, *jainas* and *parra*, Fruh). NR.

(Races are *elegans*, Mab=*karea*, Mab, *semperi* and *paceka*, Fr, Philippines; *kowaia*, Plotz=*bubasus*, Swin, New Guinea and Waigou).

4 (3). Uph usually with bluish white suffusion at tornus ; may be reduced to a few scales at base of cilia, may be very broad, may be surmounted by a white band, or a narrow white band may be present and the blue scaling absent. A very variable species.

α. Uph narrow white band at tornus, prominently surmounted by bluish scaling, brown dots at ends vs 2, 3 and 4. Upf prominent discal spots in ♀, often traceable as dots in ♂ (usually absent in other races).

**obscurus distans*, M. (45–50). The Suffused Snow Flat. Ceylon. NR.

β. Uph cilia about tornus normally white ; blue suffusion obscure or prominent and may surmount a very narrow white band. Very variable in the Nilgiris.

obscurus athos, Plotz. S. India—N. Kanara. Sikkim—N. Burma. NR.

Atticus Group—(*contd.*)

γ. Uph cilia normally brown and blue suffusion much reduced. In S. Burma transitions occur to the next form.

obscurus meetana, M. Karens to Mergui. Siam and Tonkin. (= *patimoka* and *sangarava*, Fruh). NR.

δ. Uph cilia white; white band with very little or no blue suffusion and brown spots at end vs 3 and 2. Variable and *athos* forms seem to occur.

obscurus obscurus, Mab. Malay Peninsular. Victoria Point, S. Burma. Java. Pulo Laut. Borneo. NR. (= *perakana, jetavana and mahinda*, Fruh).

η. Uph cilia white and with broad blue white suffusion. ♂ apex F produced. Larger than the other races.

obscurus alica, M. Andamans and Nicobars. NR.

5 (2b). Upf always one and more often 2 spots in cell, frequently large and conjoined. Cilia white.

japetus, Cr. (45–50). Java. C. (This occurs all the way to Australia and the variation is very remarkable; some 30 names have been assigned to it. Time may show that it is conspecific with *obscurus*).

6a (1a). Upf always a hyaline white spot in 11 over the cell spot. (In the last group the genitalia of all the species are nearly alike; in this group the differences are very marked).

Nestus Group.

Upf cell spots never conjoined; lower cell spot, lower discal spot and sometimes apical spots in 4 and 5 absent. Uph normally broad pure white tornal area, not surmounted by blue scaling, prominent marginal spots and discal spots in 4–5 and 6, usually spot in cell against upper edge and 2 spots in 7. H always slightly excavated above v4.

6b (12). Unf no discal spots in 1.

6 (7a). Uph tornal white area very narrow, only reaching v3 in ♂ and v4 in ♀; only ⅓ along dorsum. In ♂ uph a small spot end v2 and a larger spot end v1; in ♀ increasing spots ends vs 3, 2 and 1. ♂ tornus H much produced. Unh costa dark to v6.

toba, DeN. (35–40). The Small Snow Flat. ? Khasi Hills (Elwes). S. Burma, Peninsular Siam, Malay Peninsular, Sumatra Nias, Borneo. R. (= *nana*, Elwes).

7a (6). Uph tornal white area at least to v4 and half way along dorsum.

7 (8a). Uph tornal white area not above v4 or only faintly; very small spots at ends vs 4, 3, 2 and large spot end v1. Clasp.

waterstradti, Elwes. (35–45). Waterstradt's Snow Flat. Peninsular Siam, Malay Peninsular, N. Borneo and Java. R. (= *tubulus*, Fr. This is var b of Distant's *calligana*).

8a (7). Uph tornal white area always to v6 or beyond, running behind discal spot in 4–5.

8 (9a). Uph a dark postdiscal spot on the white area in 1 (may be absent) and in 3 against the discal spot in 4–5; large increasing spots ends vs 4, 3, 2, 1 and sometimes tornus; may be blue suffusion between these spots.

menaka, M. (35–45). The Spotted Snow Flat. Kashmir to Karens. W. China and Tonkin. C. (= *vulturna*, Plotz and *gavina*, Fruh).

9a (8). Uph no postdiscal spots in 1 and 3.

9b (11). Uph prominent increasing spots ends vs 4, 3, 2 and 1.

9 (10). Unh spot in 4–5 circular.

α. Uph marginal spots separate, no blue suffusion between them.

litigiosa vajuna, Fruh. (35-45). The Water Snow Flat. Ceylon. S. India. NR.

β. Uph spots usually more contiguous and sometimes with blue suffusion in between.

* *litigiosa litigiosa*, Mösch. Sikkim to Burma. Andamans. W. China. Siam. Hainan. (= *eson*, Bdv nom nud, *multipunctatus*, Crowley and *cohaerens*, Mab; *atticus*, Auct nec Fab). NR.

10 (9). Unh spot in 4–5 small, double, much smaller than the corresponding spot uph.

sumbawana, Elwes. (35–45). The Sumbawa Snow Flat. Sumbawa, Lombok and Flores. R.

Nestus Group—(*contd.*)

11 (9b). Uph only equal spots ends vs 2 and 3; no spot end v1 and spot end v4 completely conjoined to the apical dark area. H tornus more produced. Clasp

calligana, But. (35–45). The Malayan Water Flat. Malay Peninsular, Sumatra, Borneo, Nias. NR. (=*yapatha*, Fruh). (*nestus*, Fd, from the Moluccas belongs to this group and differs from the other members in having 2 more or less prominent discal spots in 1 unf; there are 22 named forms, which represent certainly numerous well defined races and very possibly more than one species).

I. 21. Abraximorpha. The Flats.

1 (2). Above slate brown with numerous white markings, presenting a chequered appearance. Uph white with large slate brown spots. Unh dark markings restricted, veins white. Palpi orange. Antennæ black.

davidii, Mab. (45–55). The Chequered Flat. S. Shan States, W and C China. R. (Race *ermasis*, Fruh, Formosa).

2 (1). Above and below dark brown, base upf, most of uph and all unh clothed olive scales. Upf with hyaline white spots as in *Celænorrhinus*, large spot in cell over origin v3 and opaque costal spot above it, large spot in 2 immediately below, detached smaller spot in 3 and in 1 towards tornus from v1–2, small detached apical dots in 4–8, spot in 6 being midway between spots in 5 and 7. H cilia prominently chequered dark brown and white. Unh there may be a small white spot in cell under origin v6 and a discal spot in 6. Palpi yellow below. Antennæ pale yellow on inside under club.

chamunda, M. (45–55). The Olive Flat. Sikkim to S. Shan States. NR.

Though very dissimilar in appearance, the structure and genitalia of these two species are nearly alike.

I. 22. Odina. The Flats. (Plate 30).

Orange and black, no hyaline spots.

1 (2). Above orange with black spots on inner half upf and a broad black border bearing a very narrow, highly zigzag ochreous line; uph with discal and marginal black spots.

* *decoratus*, Hew. (35–40). The Zigzag Flat. Sikkim to Burma, Tonkin. (= *bicolor*, Ob). VR.

2 (1). Above orange or yellow with irregularly placed black lines enclosing large patches of the ground colour, the black lines are narrow and the orange areas predominate; margin black.

* *hieroglyphica ortygia*, DeN. (35–40). The Polygon Flat. Dawnas to S. Burma. VR. (races are—*hieroglyphica*, But, Malay Peninsular, Sumatra, Borneo and Labuan, with broader black lines—*cuneiformis*, Semp, Philippines—*chrysomelaena*, Mab, Celebes).

I. 23. Mooreana. The Yellow Flats. (Plate 30).

Above black. Upf with numerous small hyaline white spots including one on costa over cell spot 2 in 1, discal spots in 2 and 3 narrow and oblique, 2 spots in cell and apical series 4–8. Uph with broad yellow tornal area to v5, surmounted by large dark discal spots, separated by pale veins.

α. Uph and unh tornal area deep yellow, continued unh by yellow veins to base.

trichoneura pralaya, M. (35–45). The Yellow Flat. Sikkim to N. Burma NR. (= *pellita*, Fruh, Tonkin and Hainan).

β. uph tornal area paler and unh very pale yellow, basal ½ wing being bluish white.

* *trichoneura trichoneura*, Fd. Karens to S. Burma, Malay Peninsular, Sumatra, Nias, Java. NR. (= *nivosa* and *niva*, Fruh).

(Races are—*trichoneuroides*, El, Borneo).

(Species belonging to the group are—*boisduvali*, Mab, Celebes with race *princeps*, Semp=*bazilanus*, Fruh, Philippines. *abstrusus*, Fruh, Dutch New Guinea. *paradoxus*, Fruh, Borneo).

I. 24. Daimio. The White Flats (Plate 30).

Above dark brown. Upf prominent hyaline white spots in 2, 3 and cell, apical dots in 4–8, usually non-hyaline spot in 1. Uph prominent white or

I. 24. Daimio—(*contd.*)

yellow discal area, outwardly bordered by dark discal spots lying on or near a broad dark submarginal band and outwardly bordered by an obscure irregular dusky pale line (No. 7 is aberrant).

1a (7). Uph plain brown or with a white or pale yellow central band.

1 (2a). Palpi white below. Cilia prominently white chequered. Upf spot in cell stretches across cell and a detached spot in 11 above it, spot in 1 detached large and sharply defined, apical spots large, conjoined. Uph with a prominent white discal area, spot in cell, base bluish. Abdomen narrowly white ringed.

Tethys Group.

tethys birmana, **nov**. (35–40). The China Flat. N. Shan States. VR. (Races are *tethys*, Men=*lineata*, Mab, Japan and N. China, with the uph plain. *moorei*, Mab=*felderi*, But, China, differing from *birmana* in being larger, the white band uph broader with edges not so parallel and the black spots not showing so clearly. *formosana*, Fruh, Formosa).

2a (11). Palpi yellow below. Cilia plain or very faintly chequered. Upf no spot on costa in 11 over cell spot.

Sinica Group.

2b (4a). Uph and unh always a prominent black spot at lower edge cell over bases vs 3 and 4 (this spot may be present in *sinica*).

2 (3). Upf spot in cell small = spot in 3, over centre of spot in 2 and against lower edge cell; apical spots 6–8 irregular, separate dots; obscure small diffused spot in 1 against v1. Uph band yellow and very narrow = ½ dark border, cell spot conjoined to dark area. Abdomen brown with very narrow white rings.

phisara M. (35–45). The Dusky Yellow-breast Flat. Sikkim to Burma, Perak. NR. (= *expansa*, Mab).

3 (2). Upf spot in cell large, reaching across cell and tapering towards scv, as large as spot in 2; spot in 1 extends to dorsum. Abdomen outer ½ (⅓ in ♀) brown, with narrow white rings, inner part pale yellow (white in ♀).

α. Upf spot in 1 usually as broad as the spot in 2 and flanked on either side by 2 black spots; apical spots conjoined and inner edges in line; cell spot placed so that its centre is over the inner edge of spot in 2. Uph pale band at least = dark margin, yellow in ♂, white in ♀; spots in cell and 7 detached; veins pale to margin. Variable.

* *bhagava bhagava*, M. (35–45). The Common Yellow-breast Flat. Bombay to Central Prov. Sikkim to Burma. NR. (*milliana*, Swin).

β. Much darker and markings narrower. Upf apical spots more irregular; inner edge cell spot and spot in 2 in line; spot in 1 against v1. Uph band white and at most = dark margin.

bhagava andamanica, W. M. Andamans. NR.

4a (2b). Uph and unh no spot in cell (except individuals of *sinica*). Upf traces of a pale submarginal fascia; spot in cell central over spot in 2; apical spots small.

4 (5a). Upf pale spot across 1 extends to dorsum; spot in cell against lower edge. Abdomen in ♂ outer ⅓ brown, rest white; in ♀ brown narrowly white ringed.

α. Upf cell spot a dot; spot in 1 usually twice as wide as the spot in 2. Uph band white, twice as wide as dark margin.

sinica narada, M. (35—40). The White Yellow-breast Flat. Sikkim. NR.

β. As last, but upf spot in 1 usually = spot in 2. Uph white band = dark margin, no spots detached, but in ♀ there is very rarely a spot in cell and the spot in 6 is semi-detached.

sinica indica, **nov**. Assam to Tavoy. NR.

α. Upf cell spot as large as the spot in 2; spot in 1 obscure. Uph white band narrow = ½ brown margin; large semi-detached spots in cell and 7.

sinica sinica, Fd. C and W. China. (= *diversa*, Leech and *epitalas*, Ob).

5a (4). Upf white spot in 1 small, against v1 or absent. Uph no spots detached. Abdomen brown, white ringed.

5 (6). Upf cell spot very small, against upper edge and = apical spot, or there may be a very narrow oblique streak across the cell; ♀ narrow white spot in 1 against v1, extending to dorsum. Above markings all small. Uph ♂ discal band smoky white, = ½ border and runs from v1 to v6; in ♀ white and = border.

I. 24. Daimio—(*contd.*)

limax dirae, Plotz. (35-40). The Malay Yellow-breast Flat. R. Tavoy to S. Burma. Malay Peninsular, Sumatra, Borneo, Nias. (= *minima*, Swin ; *graya*, Stg ; *fumosa*, El ; *formosa*, Swin. Races are *limax*, Plotz = *visana*, Fruh, Java—*corona*, Semp, Philippines).

6 (5). Upf cell spot larger than the spot in 3 and reaches the scv. Uph black margin extends into cell, pale band yellow and = ½ margin.

celebica, Fd. (40). Celebes. (= *permena*, Hew and *nivescens*, Fr).

7 (1a). Uph and unh orange with dark costa and termen ; black postdiscal spots on the orange area and spot end cell. Above black with slatey blue glaze.

Tabrica Group.

α. Upf 5 apical spots ; discal spots in 3, 2 and cell very large and conjoined ; 2 small spots in 1. Uph inner edge dark margin crenulate.

tabrica tabrica, Hew. (50-55). The Orange Flat. Darjiling. VR (? unique).

β. Upf no apical spots. Uph dark margin even, postdiscal spots conjoined to dark border apically.

* *tabrica pinwilli*, But. Assam to Burma, Malay Peninsular, Sumatra, Borneo. VR. (*bowringi*, Joicey and Talbot from Hainan is a very distinct race).

I. 25. Coladenia. The Pied Flats. (Plate 30).

Above fulvous, dark brown or grey. Upf with large hyaline white or yellow discal spots. Uph usually with dark spots.

1a (6). Uph dark spots.

1b (4a). Upf dark spot in 1 before middle. Uph in addition to discal series dark spots, there is a spot end cell, base 1 and base 7.

1c (3). Upf costal spot above cell spot confined to 11.

1 (2). Upf in 1 a tawny discal spot followed by a tawny submarginal spot and white cilia. Upf hyaline spots—white. Unh with dark spots.

α. Dark with small markings, cilia H dark brown ; upf apical spots small, separate ; uph dark spots diffused.

indrani tissa, M. (35-40). The Tricolour Pied Flat. Ceylon. NR. (= *lankae*, Plotz).

β. Dark brown with large markings and cilia H prominently chequered white. Above and below prominent tawny submarginal spots. Unf apical spots coalesced.

indrani indra, **nov**. S. India to Bengal. NR.

γ. Tawny brown. Uph black spots sharply marked, tawny submarginal spots faint.

indrani indrani, M. Mussoorie to Sikkim. NR.

δ. Above bright ochreous. Upf and below tawny spots very large and prominent. Unh yellow.

* *indrani uposathra*, Fruh. N. Burma to Karens. NR.

η. Tawny brown ; brighter than *indrani* and larger ; upf and below tawny spots large and prominent. Unh cell and 8 yellow.

indrani atarana, **nov**. Ataran Valley. VR.

2 (1). Upf single dark or 1 (or 2) hyaline spot in 1 under the discal spot in 2, no tawny submarginal spot. F hyaline spots white in ♀, yellow in ♂. Above dark tawny or fulvous brown. Uph dark spots large and suffused. Unh suffused orange and black spots.

α. Dark and dull. F hyaline spot in cell small, double, upper spot smaller and just joined to the lower spot at its base ; spot in 3 detached.

dan dan, Fab. (30-35). The Fulvous Pied Flat. S. India. C.

β. Larger, brighter. F hyaline spot in cell large and usually single ; spot in 3 usually conjoined to cell spot and to spot in 2, nearly to base of cell 3.

* *dan fatih*, Koll. (35-40). Kulu to N. Burma. C.

γ. Small and dark. Upf spot in quite detached and small. Very variable.

dan dhyana, Fruh. (25-35). Karens to S. Burma, Siam, Malay Peninsular. C. (Races are—*dea*, Leech, W. China.—*sumatrana*, Fruh, Sumatra—*eacus*, Lat = *dichroa*, Plotz, Java, Bali—*fulvescens*, El, Borneo—*lombokiana* and *sumbawana*, Fruh—*igna*, Semp=*semperi*, El, Philippines—*celebica*, Fruh, Celebes).

I. 25. Coladenia—(*contd.*)

3 (1c). Upf costal spot continued to costa. Above grey brown. Uph with prominent dark spots, rather diffused. ♀ paler and spot in 3 fills base 3.

* *laxmi*, DeN. (40–55). The Grey Pied Flat. Sikkim to Burma. Borneo. VR. (= *buchananii*, DeN). (Race *sobrina*, El, Sumatra).

(De Niceville commenced by correctly describing a ♂; later he called this a ♀ and described as the ♂ what I consider to be *Tapena atilia*).

4a (1b). Upf no spot before the middle in 1. Uph and unh no dark spot base 1 and 7. Above dark brown ; spots white upf and costal spot above cell spot confined to 11. Uph black spots sharply defined.

4 (5). Uph cilia in 6 and 7 and at extreme apex upf white. Back of tegumen simple ; clasp lobes equal.

agni, DeN. (35). The Brown Pied Flat. Sikkim to Burma, Borneo.

5 (4). Upf and uph cilia uniform. Darker. Unf a pale diffused spot in 1 outside the discal spot. Back of tegumen with a dorsal crest ; upper lobe of clasp small.

agnioides, El (35). Elwes' Pied Flat.

6 (1a). Uph prominent large hyaline spot end cell and a discal series. Above grey. Upf no spot before the middle in 1 and cell spot not to costa.

vitrea, Leech (40). E. Thibet. The Chinese Pied Flat. (= *maeniata*, Ob) VR.

I. 26. Sarangesa. The Small Flats. (Plate 30).

Above dark brown, black marbled and with small hyaline spots F ; usually a double or 2 single cell spots and a spot on costa above, spots in 2 and 3 and apical 6–8. Unh a discal row, spot end cell and bases 1 and 7.

1a (3). Unh spots small and white.

1 (2). Cilia H prominently chequered black and white. Upf spots minute or absent. Small.

α. Cilia F obscurely chequered. Upf with minute spots, including spot in 1 before middle and obscure irregular submarginal row, more prominent unf. Uph traces of small pale spots. Unh very prominent minute dots.

sati sati, DeN. (25–30). The Tiny Flat. Cutch to Central Prov. NR.

β. Cilia F and H prominently chequered. Above inky black, frosted sparse white scales, no spots. Below traces of spots.

* *sati hopkinsi*, Evans. Madras, Bangalore. R.

2 (1). Cilia very obscurely chequered. Upf single spot across cell, spot in 2 comparatively large and quadrate, 2 dots in 1. Unf obscure irregular submarginal spots. Unh small white spots. Uph obscure large dark spots.

purendra, M. (30–35). The Spotted Small Flat. N. Kanara, Bombay to Sind and Central Prov. Kangra to Kumaon. NR.

3 (1a). Unh with dark spots which are obscurely traceable uph

α. Unh dorsal ⅔ including cilia white with sharply defined small spots, 2 in 1, one in each 2 and 3, large spot in 4–5. Upf spots minute, 2 dots in cell and dot on costa above them.

* *dasahara albicilia*, M. (30–35). The Common Small Flat. Ceylon C. (=*sezendis*, Plotz).

β. Unh grey brown with large diffused dark spots. Upf very variable, may be single spot across cell or 2 dots ; discal dots in 2 and 3 present or absent. Uph cilia white.

dasahara davidsoni, Swin. S. India to Bombay. (= *hampsoni*, Swin). NR.

γ. As last, cilia brown, sometimes whitish.

dasahara dasahara, M. Central Prov. Kangra to Burma. Siam, Tonkin. C.

I. 27. Darpa. The Angles.

Above black with small hyaline spots upf, 1 or 2 in cell, may be 2 in 1, discal in 2 and 3, apical 4, 5 (may be absent) and 6–8. Uph broad pale tornal area, surmounted by a row of large black discal spots, separated by pale veins. Unh mostly pale, small discal dark spots 1–3, large 4–5, 2 spots in 7, spot upper edge cell. H produced and tornal cilia elongate. Palpi with loose brown and white or yellow scales.

1 (2a). Termen F and H highly crenulate ; H angled at v3 and v7. Upf with bands of white scaling ; cell spot across cell reaching v12 and continued along my to a small spot near base 2, apical spots 6–8 conjoined and in a straight line. Uph tornal area pale yellow, extending to v5 and bearing small

I. 27. **Darpa**—(*contd.*)

black spots ends vs 2 and 3 ; vs 6 and 7 pale to margin. H tornal ½ clothed long hairs.

hanria, M. (35-40). The Hairy Angle. Mussoorie to Assam. R.

2a(1). Termen F and H comparatively even. H only angled at v4. Upf spots normal, no spot on costa over cell spot, apical spots 6-8 separate and irregular. Uph tornal area pure white.

2(3). Uph and unh 2 small spots on white area ends vs 2 and 3. Uph white area to mid vs 3 and 4. Palpi below brown and white.

striata, Druce. (35-40). The Striated Angle. Assam to Burma, Malay Peninsular, Sumatra, Borneo. R. (=*dimidiata*, Fr.)

3(2). Uph and unh no spots on white tornal area, which extends to v4. Palpi yellow and brown below.

pteria, Hew. (35-40). The Snowy Angle. S. Burma, Malay Peninsular, Borneo, Philippines. R. (=*dealbata*, Dist).

I. 28. **Tapena**. The Angles. (Plate 31).

1(2). Above nearly black in ♂, brown in ♀. Uph an upper hyaline spot in cell between origins vs 6 and 7. Upf dark diffused central Y band, black spot near base cell, base 1 and near tornus, 2 or 3 hyaline apical dots. Uph narrow dark discal band and dark spot base 1, mid and base 7. ♀ upf dark markings faint ; separate hyaline spots cell, 2, 3 and dot in 1.

α. Large. Upf only 2 apical spots.

* *thwaitesi thwaitesi*, M. (40-45). The Black Angle. Ceylon. R.

β. Small. Upf 3 apical spots. Paler.

thwaitesi hampsoni, El. (30-35). S. India. R.

γ. Small and dark. Upf usually with 3 prominent apical spots.

thwaitesi minuscula, El. (30-35). Assam to S. Burma, Malay Peninsular. Sumatra. Borneo VR.

2(1). Above grey brown. Uph no hyaline spot, a central and discal dark band. Upf hyaline spots as in *Coladenia laxmi*, but costal spot in 11 not to costa. Unh black spots as in *laxmi*.

atilia, Mab. (40). Perak, Borneo, Philippines, Celebes. VR.

(= *palawana*, Stg. Described by De Niceville as ♂ *laxmi* in B. N. H. S. 1891).

I. 30. **Ctenoptilum**. The Tawny Angles. (Plate 31).

Above ochreous brown. Upf and uph with white hyaline spots crowded together in the middle. Upf large spot across cell and 2 spots on the costa above it, also bar end cell, 2 spots in 1, large discal spot in 2 under cell spot and sometimes a dot base 2, small spot in 3, dots in 4 and 5, apical spots 6-8 ; dark band beyond spots. Uph spots numerous and crowded.

1(2). Upf hyaline spots large at apex, spot in 7 elongated and much longer than the spots on either side ; a spot base 2. Bright ochreous brown above.

* *vasava*, M. (35-40). The Tawny angle. Mussoorie to Burma. NR. (*chinensis*, El, is the larger, brighter race from W. China).

2(1). Upf apical hyaline spots 6-8 smaller and of equal size ; no spot base 2. Below prominently frosted white scales.

* *multiguttata*, DeN. (35-40). The Multispot Angle. Manipur to Burma. R.

I. 31. **Odontoptilum**. The Angles. (Plate 31).

Above chestnut brown. Upf with hyaline white spots, but discal spots small or absent. Uph with white lines. Unh mostly white with some dark markings at tornus and costa.

1(2). Upf no white lines ; inner ⅔ pale brown outer ⅓ bright chestnut ; broad dark chestnut band before middle between v1 and scv and a similar postdiscal band ; discal white crescentic spot in 2 and dot in 3 ; prominent apical spots in 7 and 8 and may be a dot in 6. Uph pale brown and apex dark chestnut ; straight narrow white sub-basal white line, similar postdiscal irregular line, submarginal and marginal lines ; clothing of whitish hairs about dorsum and tornus.

* *angulata*, Fd. (40-45). The Chestnut Angle. S. India. Kulu to Burma. S. China, Malay Peninsular, Siam, Sumatra, Java, Borneo, Lombok, Sumbawa, Philippines. NR. (= *sura*, M ; *sumatrana*, *mahabina*, *subangulata*

I. 31. Odontoptilum—(*contd.*)

and *hyperides*, Fruh ; *helisa*, Semp ; *hypecides*, Doh ; *kuki*, Tyt-Bing MS—is an aberration. The Celebes race is *helias*, Fd).

2(1). Upf with white lines ; a line extreme base continued on H ; a short obscure line under origin of v2 ; a central line from costa to dorsum across H to the white dorsum ; a discal line from v3 to dorsum and continued as a highly irregular line on H ; apical hyaline spots small, may be a hyaline dot in 3 : H cilia white. Above dark chestnut. Upf rather obscure submarginal band of white scaling. Uph termen narrowly white, followed by a dusky band and then a broad irregular white band obscurely crossed by dark veins. Unh white to v7, faint dark tornal spots.

* *pygela*, Hew. (35-40). The Banded Angle. Karens to S. Burma, Malay Peninsular, Sumatra, Nias, Java, Banka, Borneo. R. (= *ragupta* and *javanica*, Fruh. *leptogramma*, Hew, replaces this species on the Philippines).

I. 32. Caprona. The Angles. (Plate 31).

Upf with hyaline spots ; across cell (may be divided in 2 and upper part may be absent) ; large discal spot in 2 and small spot in 3 ; apical spots 6-8 (also sometimes in 4 and 5, usually so in ♀).

1(2). Upf no prominent pale crescentic bar base cell ; usually 2 (or one lower) hyaline discal spot in 1.

α. WSF—Upf dark brown with a more or less prominent central and submarginal ochreous area from costa to dorsum ; uph a central golden to dusky ochreous central band divided by dark veins and outwardly flanked by conjoined dark spots ; a broad dark ashy border from dorsum to v4. Unh white with basal, discal and submarginal rows of dark spots, cilia dark brown.

DSF—Dark brown with numerous dark ochreous spots, exactly as in *agama* but not so well defined and discal spots in 1 are hyaline. unh as WSF, but all spots very small ; submarginal spots form dusky continuous band. Cilia very prominently chequered brown and white.

ransonnettii ransonnettii, Fd. (35-45). The Golden Angle. Ceylon. NR (DSF. VR). DSF figured by Ormiston as *siamica*).

β. WSF as last. DSF very variable. Normally bright ochreous above · upf dark sub-basal band and hyaline spot near base cell (may be a dark spot) ; broad dark band outside discal spots and separate band outside apical spots ; dusky submarginal band. Uph sub-basal, discal and submarginal row of dark spots (latter often absent). Below paler ochreous, more or less frosted white scales. Cilia whitish, faintly chequered. Above may be dark ochreous brown with the dark markings obscured and below the frosting may completely obscure the dark markings ; there are to be found trnsitional forms to the Ceylon DSF, to the WSF and to the race *alida*.

* *ransonnettii potiphera*, Hew. S. India to Central Prov., Punjab, Kumaon to Assam. NR. (= *saraya*, Doh and *taylorii*, DeN., *hamiltoni*, DeN, for which Mabille erected the genus *Gerosis*, is an aberration from Assam with the grey scaling above covering the whole wing, except for a dark central band upf and dark discal spots uph).

γ. A single variable form generally resembling the DSF of the preceding race, but typically much darker brown above, with very obscure dark markings. Below much whiter, due to intense frosting, but dark diffused spots unh show clearly.

* *ransonnettii alida*, DeN. Assam to Dawnas. NR. (*siamica*, Swin, from the Siam Shan States, is a large bright *agama*-like form, very like the Ceylon DSF = probably *mettasuta*, Fr. *erosula*, Fd = *pelligera*, Fruh, is the Celebes race).

2 (1). Above dark brown with numerous pale yellow spots in addition to the hyaline spots ; prominent crescentic pale bar end cell ; discal spots in 1 non-hyaline. Upf prominent row of postdiscal and submarginal pale spots ; central spot in cell, base 2 and in 1 below it ; spot in 11 over hyaline cell spot. Uph large pale spot in cell, discal, postdiscal and submarginal rows of pale spots. Unh white or pale yellow with prominent black spots as in *ransonnettii*.

* *agama*, M. (30-50). The Spotted Angle. S. India to Mussoorie and Burma. Siam, Tonkin, Java, Bali. (= *syricthus*. Fd ; *pelias*, Fruh ; *parvopunctata*, Mab. Moore's name is usually disregarded since he did not describe

I. 32. Caprona—(*contd.*)

the imago, but as he described the larva and pupa, under the international rules his name has priority).

var. *elwesi*, Watson. (30–35). Constantly smaller ; upf the spot before the middle in 1 is double and uph the discal row of spots is incomplete ; only a spot end cell and mid cell, no inner spot in 7 and 1. The genitalia are as in *agama*. Assam to Shan States. R.

I. 33. Gomalia. The African Marbled Skipper. (Plate 31).

Above olive brown with greenish hairs. Upf a narrow black band before the middle from v1 to scv ; semi-hyaline small spots across cell, discal in 2 and 3 and apical in 6–8. Uph a regular central white band from v1 to v7 and an obscure submarginal pale band. Below rather pale brown, white markings more extensive ; unf dorsum pale ; unh spot near base cell and base 7, discal band to v8.

* *elma albofasciata*. M. (25). Ceylon. S. India to Poona. Sind. Baluchistan ? Kangra. R. (= *litoralis*, Swin).

I. 34. Hesperia. The Skippers. (Plate 31).

Above dark brown or green with numerous white semi-hyaline spots F and H. Unh basal, central and submarginal white bands. Upf normal spotting—spot across cell at or beyond middle (sometimes one or two streaks on costa above it) ; discal spots in 2 and 3 and may be 1 or 2 spots in 1 ; apical 6–8 and usually in 4 and 5 ; in addition there may be a spot near base cell, a spot or streak at end cell, spot before the middle in 1 and rarely a spot above it at base 2, also a row of tiny submarginal spots. Unh pattern very variable ; normally a spot base cell and usually a spot on either side at bases 1 and 7 ; continuous discal row 1–7 running through large spot end cell in 4–5 ; submarginal row small irregular spots ; the spots from below appear more or less uph.

1a (11a). Upf apical spots 4, 5 absent, or if present in continuation of spots in 6–8 ; more or less prominent row of small submarginal spots. Antennæ club nearly straight or bent beyond middle. ♂ no tuft on hind tibia.

1b (6a). Upf spot about mid cell well behind origin of v3 and the discal spot in 2 ; spots in 1 consist of a spot under the spot in 2 and a short streak behind, along v1. Uph never a discal spot in 7. ♂ no costal fold.

Sao Group.

1c (3a). Unh inner spot in 7 placed immediately over the spot base cell and is continued to costa ; outer spot in 7 in line with spot base 6 and end cell, thus forming a regular basal and central band. Upf prominent spot end cell. Unh greenish brown.

1 (2). Unh submarginal spots separate. Upf marginal spots prominent ; a spot base cell, making 3 cell spots. Uph usually a spot base cell.

* *galba*, F. (25). The Indian Skipper. Ceylon. S. India to Karachi, India generally to Shan States. (= *superna*, M). C.

2 (1). Unh submarginal spots conjoined to a band, making 3 parallel bands. Upf submarginal spots faint and only show in middle. Upf and uph no spot base cell. Tegumen divided at tip instead of pointed as in *galba*.

zebra, But. (25). The Zebra Skipper. N. Punjab. R (= *hellas*, DeN).

3a (1c). Unh inner spot in 7 placed midway between spot base cell and end cell and is continued to costa ; outer spot in 7 near margin.

3b (5). Upf prominent spot end cell and usually a spot base cell upf and uph.

3 (4). Upf discal spot in 2 continued full width across 1 to v1 and a pale streak in 1 behind it.

α. Larger. F termen more rounded. Unh greenish brown and spot in 7 nearer spot end cell. Unf apex mostly white, obscuring the submarginal spots.

phlomidis phlomidis. H. S. (33). The Persian Skipper. Turkey to Persia. NR. (*amenophis*, Rev. is the race from near Cairo).

β. Smaller. Upf and unh markings wider. Unh yellow brown.

phlomidis geron, Watson. (30). W. Persia and Baluchistan. R.

4 (3). Upf discal spot in 2 just entering 1. Above exactly as *galba*. Unh greenish brown. Clasp as *sao*.

evanidus, But. (25). The Sind Skipper, Arabia and Sind. R. (?= *adenensis*, But).

Sao Group—(*contd.*)

5 (3b). Upf only a faint line end cell and no spots base cell. Darker. Unh brick red, spots white. Above discal and apical spots prominent; submarginal spots faint.

sao lugens, Stg. (30). The Brick Skipper. Chitral, Ferghana, NR at 12,000 feet. (*sao*, Berg, occurs from Europe to the Amur and there are a number of named races and varieties. *orbifer*, Hub, is one of the races).

6a (1b). Upf spot about mid cell nearer end cell, over origin of v3 and usually over the discal spot in 2; usually single spot across cell or double, one above the other; only traces of spot base cell upf, but present uph; upf only faint line end cell. ♂ upf costal fold more or less developed.

Proto Group.

6b (9a). Unh large white spot mid 7 over origin v6 in continuation of spots end cell and base 6, continued to costa and no spot in 7 interior to this spot, but there is an outer spot near margin. Above submarginal spots prominent and uph with discal spots in 7.

6c (8). Upf 2 spots in 1 between the discal and submarginal spots. Unh submarginal spots nearer the margin.

6 (7). Unh rather dark green. ♂ H tibiae spinose.

cribrellum, Evers. (34). The Spinose Skipper. S. Russia to Turkestan and Amur. (= *hybrida*, Mab).

7 (6). Unh orange with broad white markings or better described as white with central and postdiscal black edged, orange bands, H tibiae clothed, not spinose. Above markings large and prominent.

antonia gigantea. Stg. (40). The Large Orange Skipper. Ferghana, C. Asia. (*antonia*, Speyer, flies from Turkestan to the Amur and is rather smaller).

8 (6a). Upf no spots in 1 between the discal and submarginal spots. Unh yellow green to dark green, submarginal spots not so near to the margin.

tessellum, Hub (35). The Tesselated Skipper. Russia to the Amur. (There are several named races, etc.; *nomas*, Led, appears to be conspecific).

9a (6b). Unh spots in 7 smaller and not continued to costa. Above submarginal spots faint.

9 (10). Unh white spot in 7 in continuation of the spots at end cell and base 6 and an inner spot in 7 over spot base cell. Unh red brown to pale brown. Uph spot in 7 present or absent. Upf spot in 2 more or less under the cell spot.

proto, Esp. (35). The Proto Skipper. Algeria. Spain to Persia and Turkestan. (There are several named races, etc. The C. Asia race is *staudingeri*, Speyer and the Persian *plurimacula*, Christoph).

10 (9). Unh a white spot in 7 on either side of the spot base 6; inner spot far from spot base cell. Unh greenish brown or yellow green. Upf usually 2 spots in 1 between the discal and submarginal spots.

poggei, Led. (35). The Syrian Skipper. Syria to Baluchistan and C. Asia. R. (= *lutulentus*, and *fucata*, Mab; *nobilis*, Stg).

11a (1a). Upf always a spot in 5 and usually in 4; these spots are shifted out well beyond the apical spots in 6–8. Upf submarginal spots usually absent but may be faint or incomplete. Upf and uph no spot base cell and usually only a faint streak end cell. ♂ with costal fold (except *alpina*) and a tuft on the hind tibiae.

11b (17a). Unh extreme base 7 dark; always a pale spot in 7 near base and a spot over the spot end cell; spots do not reach the costa, but entire costa may be pale.

11 (12a). Upf a spot end cell and before the middle in 1, more sharply defined than the other spots; spot mid cell well behind the origin of v3; 2 equal white streaks one above the other over the cell spot. Unh spot near base 7 small circular, not, or only just, touching the scv; origin v6 nearer outer than inner spot in 7; upper edge of spot in 5 produced into cell; submarginal spots irregular. Uph spots sharply defined and usually a spot in 7 and submarginal spots. Tegumen with horns near the base and clasp without the vertical spine characteristic of the *sidae* group.

Malvae Group.

Unh dark ochreous brown with small well defined spots; dorsum dark brown. Tegumen bipartite.

Malvae Group—(*contd.*)

malvae, L. (25). The Grizzly Skipper. Europe to Amur. China. (Several races, etc., have been named; the Chinese race is *schansiensis*, Reverdin). (Other species in the group are *malvoides*, El, S. Europe and *melotis*, Dupon = *hypoleucus*, Led, Syria and Palestine).

12a (11). Upf spot end cell and before middle in 1 never so sharply defined as the rest of the spots and often one or both are absent. Unh inner spot in 7 always reaches scv and is never circular.

Sidae Group.

12b (14a). Unh upper edge of spot in 5 continued into cell more or less markedly; inner edge spots 4–5, base 6 and mid 7 not in line.

12 (13). Unh spots at bases cell and 7 do not overlap. Unh spots in 1 and 2 very enlarged and directed to the spot end cell. Upf a double streak on costa immediately over the cell spot; discal spot in 2 nearer cell spot than the spot in 3. Above very dark with prominent spots. Unh dark ochreous brown or greenish with very broad white markings.

α. Uph prominent pale markings on disc and about tornus.

* *alpina alpina*, Ersch. (25–30). The Mountain Skipper. Turkestan, Chitral to Kashmir, 10,000 feet. NR. (= *darwazica*, Groum).

β. Uph often unmarked or markings very reduced.

alpina cashmirensis, M. Kashmir. 10,000 feet. NR.

(Allied species are—*cacaliæ*, Ramb, Mountains or Europe and Altai—*andromedae*, Wallgr, Norway and Alps—*centaureae*, Ramb, = ? *conyzae*, Guen, N. Europe and N. America—*freija*, Warren, Circumpolar).

13 (12). Unh the spots base 7 and base cell overlap. Uph the submarginal spots very regular and on unh lie against a pale submarginal band. Unh with conspicuous orange or yellow, black edged, bands, recalling *antonia*.

sidae, Esp. (30–35). The Orange Skipper. C. and S. Europe to Asia Minor and Turkestan. (The Turkestan race is *struwei*, Pungeler). (Allied species are—*carthami*, Hub, N. and C. Europe to W. Asia—*onopordi*, Ramb, S. Europe and N. Africa).

14a (12b). Unh upper edge of spot in 5 not entering cell; inner edges of spots end cell, base 6 and mid cell in a straight line.

14 (15a). Upf spot near base 1 large, across 1 and an elongated spot at base 2 above it; discal spots in 2 and 3 overlap. Unh yellow green, spots faint, but with spots at bases 2 and 3; submarginal spots in 3 and 6 faint; upper edge spot in 5 continued along v6 towards termen. Unf black.

cinarae, Ramb. (35). The Eastern Skipper. S. Russia to Asia Minor and Turkestan.

15a (14). Upf at most a small spot before mid 1 and no spot base 2; discal spots in 2 and 3 not overlapping. Unh always spots at base 2 and 3.

15 (16). Unh upper edge of spot in 5 continued along v6 towards margin; outer edges of spot base cell and 7 in line; submarginal spot in 2 midway between basal and submarginal spot in 3.

alveus, Hub. (35). The Alveus Skipper. S. and C. Europe to Amur and W. China. (The W. China race is *sifanicus*, Groum).

(Allied species are—*carlinae*, Ramb, Mountains of Europe with race *speyeri*, Stg. from the Amur—*armoricanus*, Ob, France to Turkey—*foulquieri*, Ob, France to Italy).

16 (15). Unh upper edge of spot in 5 not continued along v6; outer edge spot base cell against middle of spot in 7.

serratulae, Ramb. (35). The Northern Skipper. Europe to Syria and Turkestan. (The Turkestan race is *major*, Stg and the Syrian race *alveoides*, Stg).

17a (11b). Unh extreme base cell 7 white, forming part of a basal white band. Upf a spot in cell behind the origin of v3; usually a prominent spot base 2 and below it in 4.

Maculatus Group.

17b (19a). Unh a Y-shaped basal ferruginous band from v1 across cell, the right stalk to the costa, left to v8, stalks separated by the subbasal white spot in 7.

17 (18). Unf black. Unh central white band, very irregular large spot in 1, small spot base 2, none base 3, spot in 4–5 large and quadrate, spot base 6

Maculatus Group—(*contd.*)

absent, spot in 7 large and expanding to the white costa ; ferruginous post disband and submarginal spots very irregular, submarginal spot enlarged in 1 and 2.

bieti, Ob. (30). The Chinese Skipper. W. China and E. Thibet.

18 (17). Unh central white band of equal width, except for the spot in 5, which is expanded inwards and outwards ; ferruginous postdiscal band also regular and followed by a pale brown broad marginal band, with small irregular spots on its inner edge. Unf overlaid white scales. Apex F produced and margin straight.

oberthuri, Leech. (25–30). The Thibetan Skipper. Chumbi Valley, E. Thibet, W. China and Yunnan. R. (= *delavayi*, Ob).

19a (17b). Unh a roughly oval-shaped ferruginous band (sub basal), enclosing a small white spot in 7 (may be absent). Unf black, apex prominent (may be overlaid white scales). Unh narrow silver white discal band, expanding to large white patch on the costa.

19 (20). Uph only central white spots (often obscure). Above cilia dark, only faintly chequered. Upf spots in 4 and 5 very small and separate. Unh beyond discal band pale brown with dark ferruginous central band. Very variable.

zona, Mab. (30). The Japan Skipper. Japan to W. China. (= *sinicus*, But and *albistriga*, Mab).

20 (19). Uph with prominent discal and submarginal spots Above cilia prominently chequered. Upf spots in 4 and 5 usually conjoined Uph discal spots end in a very broad white costal spot.

α. Unh dark and uniform ; discal pale band very narrow and beyond uniform dark.

maculatus maculatus, Br. and Gr. (30). The Maculate Skipper. Japan to W. China. (= *amurensis*, Stg.).

β. Unh much paler ; sub-basal ferruginous band sharply marked ; beyond the silver discal band pale ochreous brown and a second silver postdiscal band thereon. Unf apex may be white scaled.

maculatus thibetanus, Ob. E. Thibet and W. China.

I. 35. Carcharodus. The Marbled Skippers. (Plate 31).

Above greenish brown ; upf paler with a broad dark band before the middle and a similar postdiscal band ; hyaline white spots in cell, discal in 2 and 3, apical in 6–8 ; uph uniformly dark with rather obscure small pale spots in cell and discal and submarginal rows. Unh marked as in *Hesperia* ; in 7 a pale spot on either side of the discal band ; ground colour yellow brown.

1a (3a). ♂ unf a tuft of hairs from near base v1 on dorsum.

1 (2). Uph and Unh spots comparatively large and diffused. Unh dark area between discal and submarginal pale bands narrower than the discal band. Below paler, greenish grey.

altheae dravira, M. (35). The tufted Marble Skipper. Baluchistan to Chitral and Kashmir. R. (*altheae*, Hub occurs typically in C. and S. Europe with race *orientalis*, Reverdin flying from Turkey to W. Asia).

2 (1). Uph and unh spots small and sharply defined ; unh dark area between the pale bands broader than the discal band. Smaller and lighter.

boeticus, Ramb. (35). The Southern Marble Skipper. S. Europe to Syria. (= *marrubii*, HS.).

3a (1a). ♂ unf no tuft. Above and below spots smaller. Above browner with more or less violet reflections.

3 (4). Upf spot in 2 wider than high.

lavatharae. Esp. (30). The European Marble Skipper. S. Europe to Asia Minor. (= *australior*, Ver).

4 (3). Upf spot in 2 higher than wide.

* *alceae swinhoei*, Watson. (30). The Plain Marble Skipper. Baluchistan to Chitral and Kashmir. C. (*alceae*, Esp., flies from C. and S. Europe to W. and C. Asia and there are several named races or varieties).

I. 36. Nisoniades. The Dingy Skippers. (Plate 31).

Above dark brown, marbled on F with ashy bands ; no hyaline spots other than the apical spots in 6–8, which may be absent. Cilia dusky.

1a (3). ♂ with a costal fold. Uph with postdiscal and terminal pale spots,

I. 36. Nisoniades—(*contd.*)

1 (2). Upf no terminal pale spots. Uph spots yellow, comparatively large and prominent ; a spot end cell. Unf a yellow spot end cell and postdiscal and terminal spots.

α. Large. Upf yellow postdiscal spots suffused, irregular. Upf ashy central band broad = width of space 2.

montanus montanus, Br. (40). The Yellow Dingy Skipper. Japan to C. China. (= *rusticanus*, But).

β. Small. Unf pale postdiscal spots regular, well defined. Upf ashy central band narrow = ½ width space 2.

montanus nigrescens, Leech. (35). W. China and E. Thibet (= *leechi*, El).

2 (1). Upf with small terminal spots. Uph spots small, whitish and obscure. Unf outwardly paler and spotless. Below pale brown.

tages, L. (30). The Dingy Skipper. Europe to Amur. (= *cervantes*, Gras ; *popoviana*, Nord ; *sinina*, Groum ; *unicolor*, Frey ; *clarus*, Conrad ; *subclarus*, Ver).

3 (1a). ♂ no costal fold. Upf and uph unmarked except for the ashy bands and apical spots.

α. Inky black, very uniform ; apical spots prominent.

* *marloyi marloyi*, Bdv. (30). The Inky Skipper. S. E. Europe to Persia, Turkestan and Chitral. NR. (= *sericea*, Frey and *rustan*, Koll).

β. Larger, paler, upf with the ashy bands better marked and the apical spots faint. Unh with traces of postdiscal spots. Cilia greyer.

marloyi pelias, Leech. (35). W. China and E. Thibet. (= *erebus*, Groum).

(*To be continued*)

THE RETICULATE PYTHON

PYTHON RETICULATUS (Schneider)

BY

COLONEL F. WALL, C.M.G., K.H.S.

NOMENCLATURE. (*a*) *Scientific.*—The specific name conferred by Schneider is from the Latin *reticulatus* a 'net-work', and refers to the character of the markings on the body, which is very distinctive, and serves to distinguish it from the Indian Python (*P. molurus*).

(*b*) *English.*—The name Reticulate Python should be upheld, as this exactly fits the scientific name. Residents in India frequently refer to it as the Malayan Python to distinguish it from its common Indian relative, which is distributed throughout Political India. The name is not a good one as the Malayan Sub-region claims at least three species of python, that dealt with in this paper, *P. curtus*, and *P. timorensis.*

(*c*) *Vernacular.*—Burmese 'Sa-ba-gee'. The Burmese who are a remarkable race for their knowledge of jungle craft, recognize two pythons which are called 'Sa-ba-ohn' (*P. molurus*), and 'Sa-ba-jee' (*P. reticulatus*). These they distinguish mainly I am informed by the number of pits in the anterior shields along the upper lip. This is one of the most reliable means of identification employed by scientists.

Identification.—The Indian Python (*P. molurus*) has two pits on the rostral shield (i.e., the shield on the front of the snout), and a pit on the 1st and 2nd supralabials (i.e. the shields bordering the upper lip). The Reticulate Python has in addition a pit on the 3rd and 4th supralabials. Another reliable guide to its identity lies in the number of shields on the belly (ventrals). In the Indian Python, these do not exceed 270, whereas in the Reticulate Python they are not less than 297.

Colouration.—Dorsally brown of various shades, with a series of large black rhomboidal or ovate marks, connected vertebrally, running down the back from the neck to the vent. A smaller lateral series of similar marks correspond with, and are confluent to the median series. At the base of the tail there is a tendency to a continuation of the above pattern, but the detail is soon lost. The head has a black median line from the snout to the nape. A similar black line passes from the eye to the gape to be continued for a short distance down the forebody. The belly is dirty whitish or yellowish marbled laterally with brown.

HABITS (*a*) *Haunts.*—In Burma this python is only met with in the densest jungles, places unknown to Europeans with the exception of a few forest officers, and an occasional sportsman. In the Malay States and in Siam it is a fairly frequent intruder into habitations. Captain Stanley Flower who was well acquainted with the snake says, ' This python is very numerous in the city and suburbs of Bangkok ; in almost every compound of which I know the occupants, either private houses or offices, one or more pythons have been found within the last few years. Strange to say, it is not in the quiet jungle-forest that the python seems to prefer to live, but in the busiest spots along the Menam, where steamers and junks are loading and unloading, steam-launches whistling, steam-saws buzzing, rice-mill chimneys filling the air with smoke, and hundreds of noisy coolies passing to and fro ; here he selects some hole, or crevice in building, timber-stack, or bank to spend the day in, and at night makes an easy living, devouring fowls, ducks, cats, dogs, and, it is said, pigs (which, together with countless pariah-dogs, vultures, kites and crows, are the regular scavengers of Bangkok). In May 1897, a python, 2,820mm. (or 9ft. 3in.) in length, was found in the Wang Luang (King's Palace).'

Like the Indian python it is frequently found near water, into which element it will frequently glide when disturbed.

(*b*) *Disposition.*—It is a remarkably lethargic snake, showing little or no inclination to escape when encountered. Theobald says that Burmans report it as a very harmless snake of timid disposition. Some when disturbed have buried their heads beneath their coils, and made no attempt to injure their assailants. This one can readily believe for with the strength at its command a large python could easily overpower a man. Captain A. G. Frere speaking of a specimen killed in the Pegu Yomas says, ' It was encountered by an officer and his party in the jungle, by the side of a fallen trunk. It lay coiled there and wouldn't move though surrounded by ten to twelve excited and noisy coolies. A Burman went up to it, and cut it at the base of the skull with his dah and killed it.' Mr. H. C. Smith and Mr. Pudden, two Forest Officers working from November 1924 to April 1925, in the dense jungles of South Tenasserim, obtained six pythons, five of which were *reticulatus*. Mr. Pudden tells me that all these specimens behaved in just the same manner as reported by Captain Frere, except the little three footer which was encountered by him on the banks of a stream. This glided off into the water on his approach, and swam submerged some distance. He shot it when it re-appeared on the surface. In the vivarium this python awakens little interest. It lies for hours completely inert, treating contemptuously all efforts on the part of spectators to provoke a movement.

(*c*) *Striking posture.*—Animated by the prospect of a meal, the snake bestirs itself, the quarry is seized, and the snake immediately encircles it with its coils, constricting the unfortunate victim until it is a lifeless mass, when it is swallowed. When defending itself it sometimes lunges its head forward and butts with great force.

(*d*) *Sloughing.*—Young that hatched out in Calcutta shed their skins for the first time when they were about a month old. I know of no observation on this function in adults.

FOOD. Records of its diet in its native haunts show that this is very varied. The late Dr. Annandale told me that on two occasions in the Siamese Malay States he found that the little deer *Tragulus* *javanicus* had been victimized. Cantor says it feeds on quadrupeds and birds. Captain Stanley Flower already referred to mentions cats, dogs, pigs, fowls, and ducks. He records one killed in the Siamese King's Palace measuring 9 feet 3 inches, which on being cut open was found to contain one of the Royal cats, with the bell attached to its neck. In Regent's Park it has taken dead ducks offered.

Mr. E. G. Boulenger (The Field 5-4-13) mentions finding in the cage of a 22-footer caged in Regent's Park, three hair balls five inches in diameter, representing the undigested remains of a kid upon which it had fed ten days earlier. The young hatched out by Herr Fockelmann at Gross Borstel in 1907 accepted white mice, but those hatched out in Calcutta in the same year refused milk, eggs, frogs, small birds, and white mice, and died within three months.

FASTING. That this python can exist and maintain its health for very long periods without taking food is exemplified by the remarkable instance of a captive specimen in Regent's Park, that refused food for one year, and eleven months after which it indulged in a meal and continued to feed normally. During incubation food is not accepted.

DRINKING. Like other snakes it slakes its thirst by drinking, swallowing water in gulps, and not lapping.

BREEDING. (*a*) *The Sexes.*—I know of no difference in the sexes except that the claw-like termination of the concealed rudimentary hind limb, which is visible near the cloacal orifice, is relatively larger in the male.

(*b*) *Method of Reproduction.*—This species like most other pythons is known to be oviparous. (The African *P. regius* is viviparous).

In Hagenbeck's case the dam gathered her eggs together by encircling them in her coils, in such a manner as to avoid subjecting them to her weight. During the period of incubation she was observed at times to release her coils, so that some of the eggs became visible. After 79 days of unremitting attention, the dam forsook her eggs when the first hatchling was observed emerging from its shell.

The dam that deposited eggs in Calcutta in 1907 acted similarly, beginning to encircle her eggs only when the last had been deposited, and then completely concealing them from view. This dam left her eggs at intervals 'when compelled to do so.' This suggests that she was provoked to do so, perhaps with a view to ascertaining the fate of the eggs.

The late Dr. Annandale told me that while the dam in Calcutta was encircling her eggs, her breathing was considerably accelerated. A few hours before the eggs began to hatch she abandoned them to their fate.

Fockelmann's dam is reported to have left her eggs at night when she visited her bath.

The incubation of snakes eggs differs from that of birds, in that the dam imparts no warmth to them. Experiments prove that the dam's body temperature is not raised during this period. It appears to me that in encircling her eggs the python submits them to darkness and protects them from atmospheric conditions likely to prove detrimental. The fact that in Herr Fockelmann's case, fifteen of the eggs that were rejected by the dam ten days after commencing her maternal devotions, dried up, and when examined proved to be quite hard, with no signs of internal life, seems to suggest this explanation, as several of the other eggs not rejected, hatched out subsequently. I find after very many attempts to incubate snake's eggs artificially, that exposure to sunlight rapidly sterilizes them. In a few hours the shells harden, becoming dimpled first, and shrivelled later. I find the most successful results are attained by submitting them to a process similar to that adopted in the relaxation of butterflies. A piece of slightly damp blotting paper is placed at the bottom of a biscuit tin. On this is placed some cotton wool, and on this the eggs are laid out, and the box lid closed. If the blotting paper is a shade too damp, the eggs become mildewed and sterile. The method here described was successful in hatching out two broods of cobra's eggs by me in Karachi in 1922, and several other broods at different times.

(*c*) *Season.*—In the three breeding events known to me the eggs were deposited as follows; on April 11, 1909, (Basu's dam in Calcutta), the end of August or beginning of September 1907 (Fockelmann's at Gross-Borstel) and October 28, 1904, (Hagenbeck's in Colombo). These dates suggest that breeding may occur throughout the year.

(*d*) *Period of Gestation.*—Not known.

(*e*) *Period of Incubation.*—In Hagenbeck's case the period occupied was 79 days, and in Basu's case from 55 to 60.

(*f*) *The Eggs.*—Basu's dam laid 59 eggs, Fockelmann's 96, and Hagenbeck's about 100.

Fockelmann records that his eggs measured 10 cm. (about 4 inches) in length, that they were of a depressed oval in shape, with an exceedingly tough shell. The weight of one of Basu's brood was 5½ ounces.

GROWTH. (*a*) *The Hatchling.*—One of Basu's brood measured exactly 610 mm. (2 feet) when hatched. Hagenbeck's brood measured from 610 to 762 mm. (2 to 2½ feet). The weight of Basu's measured specimen was 4 ounces 2 drachms.

(*b*) *Early Life.*—Bibron's observations of the growth of young hatched out in Paris, shows that they increased by about 685 mm. (2¼ feet) annually in the first your years of life. A python 33·5 cm. (11 feet long) in London, grew another 30·5 cm. (10 feet) in 11 years, after which no further growth was observed.

(*c*) *Maturity.*—It is not known at what age this python is sexually mature.

(*d*) *Maximum Length.*—The reticulate python is the largest snake in the world, attaining to a length of nearly, if not actually. thirty feet. Wallace (*Tropical Nature*, p. 115) records that a Mr. St. John states that he measured one in Borneo that was 26 feet long. Collingwood (*Rambles of a Naturalist*, p. 172) says that Mr. Low assured him he had seen one killed at Labuan that measured 26 feet long, and heard on good authority of one 29 feet. Captain S. S. Flower mentions that a Mr. L. Wray (junr.) measured one killed at Taiping, Malay States, that was 27 feet. When skinned and stretched it was 33 feet. Hagenbeck's brooding python from Borneo was reported about 28 feet. Cantor mentions one killed at Penang which a gentleman informed him was 30 feet.

WEIGHT. Hagenbeck's 28-footer turned the scale at 250 pounds, i.e. two pounds less than 18 stones.

PARASITES. *Entozoa.*—Pythons harbour many internal parasites. The late Dr. Annandale told me he had dissected many *reticulatus* when in the Malay States, and in some he found extraordinary numbers of a nematode worm (*Ascaris infundibulicola*) in the stomach and intestines. This appears to be a different worm from *Ophidascaris filaria* mentioned by Baylis and Daubuny as occurring abundantly in the alimentary canal of pythons. They were found on nineteen occasions in *molurus*, and the immature worms in the lung of both *molurus* and *reticulatus*. This parasite appears to take up its habitat while immature in the lung, and to migrate to the intestine when attaining its final metamorphosis.

LINGUATULIDS. Dr. Annandale discovered linguatulids on two occasions in the tounges of this species, and one such parasite was removed from the mouth of a *reticulatus*, that died in Calcutta.

These curious parasites have been also called tongue worms. The name is unfortunate since in the pamphlet issued by the British Museum with instructions to collectors of worms, we are told that they are not worms. Their affinities are doubtful, but they are usually considered to belong to the Arachnidae, and therefore are allied to spiders and mites. It is better therefore to drop the name tongue worm, and to refer to them by their scientific name only. Miss Mary Hett, B.SC., has contributed a paper on these parasites which appeared in the Proceedings of the Zoological Society of London in 1924. From this I extract the following further information :—

The adult is an internal vermiform parasite with a flattened or cylindrical annulated body. The rings vary in number throughout the family but are more or less constant for each species.

The life history usually involves two hosts, an intermediate host which may be a fish or a mammal, and a final host which is usually a reptile, but may be a mammal or bird. The adult is found chiefly in the lungs and air passages of the host, but may occur in the body cavity or alimentary canal. The eggs pass from the lungs by way of the mouth to the alimentary canal, and pass out with the faeces, being scattered over vegetation or into water. The infected vegetation or water gains access to the alimentary canal of the intermediate host in its food. It seems possible however that the whole life cycle may occur in the same host without the agency of the intermediate host. When the embryos still enclosed in the egg envelope reach the alimentary canal of the intermediate host, (or the same host) the outer coverings are dissolved by the digestive juices, and the embryos are set free. By means of a boring apparatus and clawed limbs, the embryo pierces the gut wall, and is carried by the blood or lymph to some organ of the body, usually the lung, where it becomes encysted. Here it undergoes a series of ecdyses finally emerging from the cyst when the larval development is complete.

The fully developed larva when emerging from the cyst has an annulated body, no limbs, a head with a mouth, around which two pairs of horny hooks are placed with which the parasite anchors itself to the tissues, battening by suction of the host's blood.

SARCOCYSTS. Dr. Annandale in a letter to me says 'all specimens of *P. reticulatus* that I have examined in autopsy, whether here (Calcutta) or in Malaya have had immediately under the skin, numerous little bean-shaped bodies of a livid colour, and varying considerably in size and hardness. These I have ltitle doubt are parasites allied to Sarcocystes (Protozoa), but the Patani Malays call them "the strength of the snake" and regard them as centres of its constricting power. They say no python could be strong without them.'

LEPIDOSIS. The shields on the head of pythons are somewhat different from those on colubrines. The body shields and scales are also different in many ways, being more numerous than in colubrines excepting the Sea Snakes.

Rostral.—As deep as broad ; visible above ; with a pair of large pits. *Internasals.* A pair, nearly as long as the præfrontals. *Præfrontals.* A pair, rather shorter than the frontal ; separated from the frontal by a pair of smaller shields. *Frontal.* Usually entire, sometimes more or less divided mesially ; about three-fifths the length of the snout. *Supraoculars.* Well developed, usually entire ; as long as the frontal. *Parietals.* Not differentiated. *Nasals.* A large shield with the nostril in the upper and posterior part ; a suture running from nostril backwards to anterior loreal. *Loreals.* 4 to 5. *Præoculars.* 2 or 3, the upper largest. *Postoculars.* 3 or 4. *Temporals.* Not differentiated. *Supralabials.* 12 to 14 ; first four with pits ; 7th or 8th touching the eye. *Infralabials.* 19 to 22 ; the first 2 to 3 pitted, and also 5 or 6 of the posterior. *Sublinguals.* Not differentiated ; a mental groove between about seven pairs of scales. *Costals.* Two heads-lengths behind the head 57 to 62, midbody 69 to 79, two heads-lengths before the vent 38 to 40. No keels. No apical pits or facets. *Vertebral.* At midbody breadth about two-thirds the length, less than one-third those in the ultimate row. *Ultimate.* Breadth, nearly twice their length ; two-fifths that of the ventrals. *Ventrals.* 297 to 330. About eight pairs of scales between the first and the mental groove. *Anal.* Three, the outer corresponding to the ultimate row. *Subcaudals.* 75 to 102 ; mostly divided, some frequently entire.

DENTITION. From two skulls in my collection. *Praemaxilla.* four sub-equal teeth. *Maxilla.* 16 to 17 ; anododont, syncranterian, strongly scaphiodont. *Palatine.* 6 to 7 ; anododont, scaphiodont. *Pterygoid.* 8 to 10 ; anododont, feebly scaphiodont. *Mandibular.* 17 ; anododont, feebly kumatodont, the 3rd tooth longest. The teeth in all the jaws are set inwards, and are peculiar in shape, being compressed, rounded on their anterior convex faces, and sharply edged and concave posteriorly.

DISTRIBUTION. Within the political limits of the Indian Empire the reticulate python is confined to Lower Burma, and Tenasserim.

It has also been recorded from the Nicobar Islands. Though Theobald says it is pretty common in Pegu, available records make it appear a rare snake in Lower Burma. Captain Frere sent me some years ago the skin of a specimen killed by an officer of his party in the Pegu Yomas about 15 miles from Minhla. This measured 17 feet 6 inches. The ventrals were 301, and subcaudals dubiously 75. The scales at midbody numbered 75, and the first four supralabials were pitted. This is the only specimen I can vouch for outside Tenasserim. In this province the snake is not uncommon, certainly more common than *molurus*. Mr. Noble for 18 years Superintendent of the Zoological Gardens in Rangoon told Colonel G. H. Evans in 1908, that he only knew of four specimens. These were from Tavoy, Mergui, Rangoon (found in a cargo of cocoanuts on board ship), and dubiously Pegu where he said Colonel Bingham obtained a specimen. Colonel Bingham however shortly before his death wrote in answer to my enquiries that his specimen was from Martaban. Captain Frere sent me the skin of one from the Amherst District. Mr. Smith, I. F. S. during his jungle work in S. Tenasserim 1925 had six pythons brought in by his coolies. One skin examined by me was a *molurus*, and one a *reticulatus*. The remaining four were reported *reticulatus*.

This python has at times been transported in ships from port to port. One of Noble's four just alluded to was found in Rangoon in a cargo ship. One was discovered in the cargo of a ship in Bombay that had arrived from Moulmein. Another was found in the hold of a ship in the Albert Docks, London, in 1907, and transferred alive to Regent's Park.

ADDITIONAL NOTES ON THE AVIFAUNA OF IRAQ

BY

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(LATE CAPT., R.A.M.C.)

ASSISTED BY

SIR PERCY COX, G.C.M.G., G.C.I.E., K.C.S.I., M.B.O.U.

AND

MAJOR R. E. CHEESMAN, M.B.O.U., F.R.G.S.

(*with 3 plates*)

INTRODUCTION

The following paper should be read in conjunction with the Birds of Mesopotamia [1] to which it forms an addenda. The contents are founded entirely on records supplied by Sir Percy Cox and Major R. E. Cheesman and the collector employed by Sir Percy Cox, La Personne, and on specimens which were brought back by them and includes information and specimens supplied to them from various sources (acknowledged below). The period covered is from the return of Sir Percy Cox and Major Cheesman to Iraq in October, 1920, down to their departure in 1923.

Much of the information naturally comes from the Baghdad area but both Sir Percy Cox and Major Cheesman undertook various trips in the plains while the latter made a special trip to the Pusht-i-Kuh, east of Ali Garbi (Luristan) and though outside Iraq proper such records, as are noteworthy, are for convenience added to this paper and are referred to as ' the hills east of Ali Garbi '. La Personne was employed to undertake special trips to Dohuk and Mosul in the north, the Euphrates marshes, Fao and the islands at the head of the Gulf. In all a very considerable collection was got together, the avifauna of additional areas investigated, many gaps in and knowledge of Iraq birds filled and many of our former observations confirmed.

In this paper I have only listed those species concerning which any additional information has come to hand whether it be in status, distribution, nidification or habits, etc., and in a few cases where former statements need modification. 25 species are now added to the avifauna ; of these 14 come from the Mosul-Dohuk area, 5 from Baghdad area, 3 from Fao area, 2 from Rutbah Wells district and one is now extinct, in addition one more is extra limital. Five further races have been described as peculiar to Iraq ; of species known to occur in Iraq a further 16 sub-species are listed (plus one extra limital) while the representative race of 7 others which were in doubt before have been now satisfactorily determined. One remains yet to be solved—The Finch Lark. Three races have been removed, viz., *Prinia gracilis lepida*, *Podiceps ruficollis capensis* and *Ammoperdix griseogularis ter-meuleni*. Original references are only given to species or sub-species which are additional to those given in the previous paper. (C.B.T.) *B.N.H.S.*, 1921, pp. 197-237, 1922, pp. 269-315 ; 325-349 ; 371-390.

Description of additional localities—

1. *Dohuk.* A small town in the Kurdistan foothills, near the Iraq north frontier, lying in a valley with a stream and fruit gardens of pomegranates, and figs ; it is shut in on the south by Dohuk Dagh (2,000 ft.) and by the Jebel Abiad and Tang-i-Dorg on the north while beyond these rise range after range of the Kurdistan highlands. The lower slopes of Dohuk Dagh are covered with vineyards and further up is stunted oak.

2. *Dara, Boonah and Gabr-an Nakhuda* are three islands in the Khor Musa at the head of the Gulf N. E. of Fao. Dara Is. lies 3½ miles S. W. of Boonah and is half a mile across and is cut across itself by a creek ; a ridge runs from end to end and is covered with a ' salt bush ' scrub. Boonah Is. is a mile long and half a mile wide. Gabr-an Nakhuda lies 13 miles N. N. W. of Dara and is 100 yards × 75, it is covered with low scrub. All these islands are more or less connected at low water. The Khor Musa is a broad estuary holding water at high tide, much exposed at low ; it runs many miles inland dividing into other creeks.

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[1] *Journn., Bom. Nat. Hist. Soc.*, vol. xxviii, Nos. 1, 2 and 3.

3. *Bubyan and Warba Islands* are practically part of the mainland ; they lie at the head of the Gulf 2.¼.2. of Fao. Bubyan is 26 miles long N. to S. and 12 miles broad, barren and partly covered at high tide ; a large creek the Khor Milah runs into the island. It is separated from the Koweit mainland and Warba Is. by a creek—the Khor Sabiyah (½ mile wide) which is partially dry at low water, and from the Fao mainland by the Khor Abdulla 2½–13 miles wide.

4. Warba Is. lies to the north of Bubyan and is separated from the Fao mainland by the head of the Khor Abdulla (here ½ a mile wide) and is 7 miles long E. N. E.—W.S.W. and 2½ miles broad. These two islands were referred to in the previous paper as ' Abdulla Banks '.

5. The area referred to in this paper as '*the hills east of Ali Gharbi*' includes the arid foot hills of the Jebel Hamrin ; but beyond the limits of Iraq it also includes a plain (1,000 ft.) rising gradually to the Pusht-i-Kuh Hills (up to 3,500 ft.) and a valley running to the east (2,000 ft.). Here there are a few running streams and the hill tops are covered with oak forest.

The following is a list of those who also assisted in the forming of this collection in various ways—procuring specimens, helping with transport, bringing information, etc. All care possible has been taken with the spelling of names but as many have been extracted from indistinct labels it is hoped that errors and omissions will be excused. In addition Mr. E. C. Stuart-Baker has kindly sent a few notes on such eggs as called for remarks.

P. S.—Just as this manuscript was going to Press there appeared in the *Ibis* (Oct. 1924, pp. 601-625) a very valuable paper by Col. R. Meinertzhagen on a ' Collection of Birds made in Iraq '. The author entered Iraq from Palestine to Ramadi and during 3 months' stay (Nov-end of January) visited several places which were little or unknown ornithologically, notably Mosul and the district, up to the Turko Iraq frontier and S. Kurdistan. For the sake of completeness I have included in this paper his more important observations which are additional to information already to hand. Such are initialed (M) or are referred to by name.

H. M. King Faisal
H. H. The Amir Zaid
Capt. Aldworth, D.S.O.
Sayid Jafar Ataifa
Haji Adha
Miss G. L. Bell, C.B.E.
Capt. Buist, R.A.M.C.
Mr. Butcher
Mr. Barnes
Capt. I. N. Clayton
Major G. S. Cameron, M.C.
Dr. Corner
Mr. C. E. Capito
Mr. Cowley
Mr. A. Dutt
Major H. R. R. Dickson, C.I.E.
Mr. Empson
Major C. I. Edmonds
Major A . D. Fraser, D.S.O., R.A.M.C.
Shaikh Fahad Beg
Mr. RleFernandez
Mr. Glenister
Lieut.Grand, R.E.
Lieut.-Genl. Sir A. Haldane, G.C.M.G., K.C.B., D.S.O.
Haji Naji
Hassan Segar
Capt. Hitchcock, Railways, M.E.F.
Capt. S. E. Hedgecock
Col. A. E. Hammerton, C.M.G., D.S.O., R.A.M.C.
Sayid Husain Afnan
H. H. The Said Sultan of Najd
Major Jeffries
Lieut.-Col. P. C. Joyce, C.B.E., D.S.O.
Khan Saheb Soofi
Mr. G. C. Kitching
Mr. Kinch
Capt. C. Littledale, M.C.
Major J. More, D.S.O.
Dr. Norman
Capt. Pedder
Mr. Nelson Porter
Major Pulley
Mr. Penny
Mr. L. T. Pollard
Mr. J. Parlby, O.B.E.
Mr. H. St. J. B. Philby, C.I.E.
Capt. R. Palmer, R.N.
Lt-Col. R. Prescott, C.I.E.
Shaikh Rashid al Khalof
Flight Lieut. Mclaren Reid
Flight Lieut. Robb, R.A.F.
Mr. Rooke
Capt. H. M. Stanford, M.C., R.F.A.
Mr. Swami
Sedhid
Shaikh Salem al Khayun
Dr. Sinderson
Mr. A. G. Tomlinson
Tota Ram
Mr. Roger Thomas
Mr. Thompson
Col. J. R. Tainesh, C.B.E.
Col. Sir A. T. Wilson, K.C.I.E., C.M.G., D.S.O.
Major R. J. Wilkinson
Mr. Webster
Mr. L. W. White
Major Yetts, M.C. and others

Raven. Corvus corax laurencei, Hume.

Occurs north to Mosul and S. Kurdistan at least in winter, one seen at Rutbah wells end of October (M).

Hooded Crow. Corvus cornix.

Corvus cornix sardonicus (Orn. Monats., 1903, p. 92, Sardinia). This is the only Hooded Crow at Mosul and then only in winter. La Personne noted it at Mengashi, Dohuk area, by November 18. The Hooded Crow which visits Iraq in winter has always been called *sharpii* but I am doubtful if this race occurs there at all. In the ' Birds of Mesopotamia ' I listed two specimens as *sharpii* and I have not been able to re-examine these but five more from Dohuk, Baghdad Fao (examined by Cheesman and myself and compared with the type of *sharpii*) are too small and too dark. They are the same colour as Egyptian and Sardinian birds and measure ♂ ♀ 283-304. The type of *sharpii* comes from Mardan in the Punjab ; it is a much larger and paler bird.

Corvus cornix capellanus, Sclater. The early breeding season is fully confirmed ; a nest with 3 eggs at Qarradah, Baghdad, on February 22, another at Fao on the 21st with four eggs. Late in the breeding season the mantle becomes nearly white and the wings rusty brown. Noted at Ramadi in November, Khanikin and Kerkuk in December (M).

Rook. Corvus frugilegus L. ' Zarg '.

Flocks were seen crossing the Jebel Abiad, Dohuk area, going south on December 13. Meinertzhagen saw flock after flock arriving at Mosul from the N.'E. on November 25, at an elevation of 800 feet ; he estimated a huge roost on the open plain at Khanikin to number 193,000 birds.

Jackdaw. Corvus monedula soemmeringii. Fisch (=*collaris* auct.)

Breeds at Mosul. Meinertzhagen found them not very uncommon at various places north of Baghdad in winter, there usually being some with each flock of Rooks he also saw pure flocks emigrating at Hadr on November 22 and at Khanikin at the end of December (M).

Magpie. Pica pica bactriana Bp.

Recorded as resident and breeds at Mosul ; very common at Dohuk old nests being seen everywhere. Resident at Sadiyeh 60 miles north of Baghdad where there is a belt of palms ; also found at Kirkuk. Noted at Nasiriyeh (M).

Chough. Pyrrhocorax pyrrhocorax (L) Syst. Nat. Ed. x, 1758, p. 118—England.

Common in the hills east of Ali Gharbi near Pir Mahommed and other places at 2,500 and 3,000 feet in October ; a pair were seen in the foot hills as low as 1,000 feet. Wings 3. 305-311. 293. Common at Dohuk and Zakho—(M).

Jay. Garrulus glandarius

Garrulus glandarius atricapellus, Geoffr. (Etud. Zool. fasc. 1, 1832-Libanon) La Personne met with this Jay on the Tang-i-Dorg (Dohuk area) in October ; a flock was seen working round the mountain in search of food, and it was noticed occasionally in gardens at Dohuk. Cheesman met with jays at Chasmet Sherin 2,500 ft. and several more at Pir Mahommed, 4,000 ft. in oak woods on October 11. The last two localities are in the hills east of Ali Gharbi. W. 177-182.

Starling. Sturnus vulgaris.

1. *Sturnus vulgaris vulgaris* (=*sophiæ* auct). This is the common winter starling in Iraq. Whether it is sufficiently distinct to warrant recognition is a matter of opinion. A fair number of specimens are recognized in having a purer green mantle and scapulars and the flanks more tinged with purple violet than in typical *vulgaris*, the spotting on the upper parts too, is often paler, but none of these characters is by any means constant and quite a number are not to be picked out from West European birds. Specimens were obtained from Dohuk area in the extreme north to Zobeir oasis in the extreme south ; examples were obtained also migrating over the highlands of Dohuk on November 1.

Sturnus vulgaris nobilior, Hume Out of six birds obtained at Mosul, three of which were shot in the town itself and probably belong to the

Starling—(*contd.*)

resident form, five are not separable from *noblior*. All have purple heads, throats and ear coverts as well as under tail coverts and have black, white-edged under wing coverts ; the rump and upper tail coverts vary, some are more purple than others ; the mantle is grass-green. They are indistinguishable from Kandahar birds. If, as seems likely, this is the breeding race at Moslu the breeding area of *nobilior* will need some extension. I am still of opinion that *oppenheimi* is not a good race and in fact, is according to Drs. Hartert and Stresemann who have seen the type, nothing but *purpurascens* (*Ibid* , 1924, p. 604) as already hinted in our previous paper.

3. *Sturnus vulgaris purpurascens*, Gould (Proc. Zool. Soc, p. 219, 1868, Erzeroom).

The sixth starling shot in the country near Mosul on January 13 is a typical *purpurascens*. We had no certain record of this race in our area. Obtained at Basra in February (M).

It seems to me that the Asiatic Starlings still need a lot of working at but nothing can be done without a larger amount of material in the way of breeding birds over a wide area.

Rosy Pastor. Pastor roseus (L).

Additional record. Two flocks, 20 in each were seen by Sir Percy Cox flying up the Tigris 10 miles above Baghdad on May 14.

Golden Oriole. Oriolus oriolus oriolus (L).

Arrived in the first days of May confirmed both at Fao and Baghdad, males coming first. At the Chekkan River (Jebel Hamrin) one was seen to arrive from a great height and go to roost in the only tree October 8.

Siskin. Carduelis spinus (L).

Noted at Mosul January 8. Flock arrived at Baghdad January 15, and were found to be feeding on seeds of *Zinia*.

Goldfinch. Carduelis carduelis niediecki Reich.

Noted as common at Mosul in winter and flocks were seen on Tang-i-Dorg (Dohuk) in November. Winter visitor annually at Baghdad. All specimens belong to this race. An old nest found at Feshkhabur on the Turko-Iraq frontier (M).

Linnet. Acanthis cannabina fringillirostris Bp. and Schleg.

Common at Dohuk in small flocks in open fields and along streams. Arrived November 3. Flock noted at Kirkuk in winter.

Red-fronted Serin. Serinus pusillus (Pall.).

Common in the hills at Dohuk at 2,000 feet coming frequently to springs.

Syrian Serin. Serinus syriacus, Bp. Consp. Av., i, p. 523, 1850, 'ex As. occ. Bischerra'.

Appeared at Dohuk at the latter half of December in fairly large numbers feeding on seeds of reeds and became common. Common at Mosul in January.

Rose Finch. Rhodospiza obsoleta (Licht.).

A flock noted on March 11, in an isolated garden at Baghdad feeding on the buds of the pomegranate. Another flock at Hillah on February 1. Scarce winter visitors.

Chaffinch. Fringilla cœlebs cœlebs (L).

Arrived in the gardens at Dohuk November 2, and became common. Common too at Mosul.

I have examined a very large series of Asiatic and West European Chaffinches. In the Asiatic birds (Asia Minor, Iraq, Persia) the reduction in the brown mantle in the males is by no means constant nor have they stouter bills. Some of the females are 'colder' less brown on the back but they vary very much. Therefore I must unite these Iraq birds with the typical race ; I have not seen West-Caucasian birds (*solomkoi* Menzb. and Suschkin) but one would expect the Iraq birds to be the same and I much doubt whether *solomkoi* is a good race.

Chaffinch—(*contd.*)

Fringilla montifringilla L. First seen at Dohuk on December 19, and it became common ; flocks were noted migrating south down the valley. Common at Mosul in January in Tamarisks and wheat fields. Obtained at Baghdad on January 21. Three seen at Kirkuk in winter.

Greenfinch. Chloris chloris.

Chloris chloris turkestanica, Zar. (Orn. Monat., 1907, p. 61. N. W. Turkestan).

Greenfinches were common in the gardens and in trees on the hills side at Dohuk on La Personne's arrival October 17, and remained so. Noted as common at Mosul in January. A good series were obtained, these are of the same size in wing and bill as the typical race but are brighter and paler, and in this respect are much as in *chlorotica* but of course are much larger. ♂♂ W. 86–90.

Rock Sparrow. Petronia petronia exiguua (Hellm.).

Small flocks seen on the cliffs on the Tang-i-Dorg often associated with Alpine Accentors. Only two specimens obtained ; these are not *intermedia*, they are only very slightly paler than French birds. ♂ wing 102·5, ♀ 94·5, they correspond well with *exiguua*.

Yellow-throated Sparrow. Gymnorhis xanthocollis transfuga, Hart.

Breeding at Baghdad May 16, flying young there on June 21, and fresh eggs (4) on June 30, so that this species must be double brooded. No record beyond Baghdad.

House Sparrow. Passer domesticus biblicus Hart.

Cheesman noted nests built on branches of trees in a wood near Baghdad. Nests with six eggs on June 12, and another with four eggs on June 22 are late. Common at Mosul and specimens thence are rather darker than those from lower Iraq but this may be due to dirt ; they are paler and have longer bills than the typical race.

Scrub Sparrow. Passer moabiticus moabiticus Trist.

Two colonies visited by Cox and Cheesman had nests with fresh eggs (4 and 5) on May 16 ; a nest on June 12 held 4 incubated and 2 fresh eggs. A flock was met with at Hindeyeh Barrage on September 17 feeding on bull-rush seed.

Spanish Sparrow. Passer hispaniolensis transcaspicus, Tchusi.

Cheesman noted flocks migrating over Baghdad on May 16. At Qalet Dasar (Pusht-i-kuh) flocks were migrating down a ravine on October 8. A colony of old nests of the species found at Barzia (Pusht-i-Kuk.)

Corn Bunting. Emberiza calandra calandara, L.

Most have left the vicinity of Baghdad by March 11, but quite a number remain to breed in cultivation and rank grass. A nest of 3 eggs and 4 young was found on April 18 and another with 5 eggs at Shergat in April. Exceedingly common at Mosul and Dohuk, at least in winter. Some were met with the Pusht-i-kuh near Pir Mohammedi 2–3,000 feet. A nest with six eggs from Jift March 19 (Aldworth).

Yellow Bunting. Emberiza citrinella.

Emberiza citrinella erythrogenys, Brehm (Vogelfang, p. 414, 1855—Sarepta). Two were obtained at Dohuk, October 13 and December 15 ; 'possibly numerous'. Paler above and on the edges of the wings than West European examples.

Meadow Bunting. Emberiza cia.

Emberiza cia par, Hartert (Vog. Pal. Fauna, p. 184—Transcaspia).

One shot from a flock at Dohuk on December 15 ; 'possibly numerous'.

Black-headed Bunting. Emberiza melanocephala, Scop.

Odd males at Baghdad on April 24 and May 15.

Ortolan Bunting Emberiza hortulana L.

Very large flock at Baghdad on passage on April 25 also noted on passage April 17 Gabr-un-Nakoda Is (Fao area) and April 18, 23, on Bubyian Is (Fao area).

Reed Bunting. Emberiza schœniclus pallidior, Hart.

Obtained at Kirkuk and Zakho in December (M).

Black-crowned Finch Lark. Pyrrhulauda frontalis.

La Personne was sent twice to the desert west of Basra to get these Finch-Larks, but unfortunately, though common, he only succeeded on the second trip in June. Three males, two females (lab. ♂) and a juvenile were obtained, but naturally they are in very bad condition—very worn and moulting. I have already pointed out how the Iraq males differ from the African and Arabian races and can now add that the Iraq female and young are greyer above than *frontalis frontalis* and paler than *f. melanauchen*. Both sexes are no longer in wing and have rather differently shaped bills to *syncipialis*. In length of wing and in bill I cannot distinguish them from the Sind *affinis* and as regards colour I can come to no conclusion as the specimens are so poor.

3 ♂♂ W. 84.5–87 ; Bill from base 13 greatest height 7
2 ♀♀ W. 78.82 ,, ,, ,, 13·5 ,, ,, 7
Series *syncipitalis* W. 79–83 ,, ,, 11·5–12·5 ,, ,, 6

The Iraq specimens came from the Oasis of Huwaile about 16 miles from Koweit. I must leave them as indeterminable.

Calandra Lark. Melanocorypha calandra.

1. *Melanocorypha calandra calandra* (L).
2. *Melanocorypha calandra psammochroa*, Hart.

Both races occur in the Iraq plain in winter ; a Calandra Lark breeds at Mosul but we have no breeding specimens to determine which race.

3. *Melanocorphya calandra hebraica* Meinertz. (Bull. B.O.C., xli, 1920, p. 21—Palestine).

Meinertzhagen records that he obtained two at Hadr on November 23, which he considers to be of this case.

Skylark. Alauda arvensis cantarella Bp.

Again in this additional collection there are some skylarks which appeared darker on the mantle, less grey, than *intermedia* (=*dulcivox*) and I can only suppose that they are *cantarella*, the South European bird. I have been unable to see any certain *cantarella*, obtained at the same time of the year however.

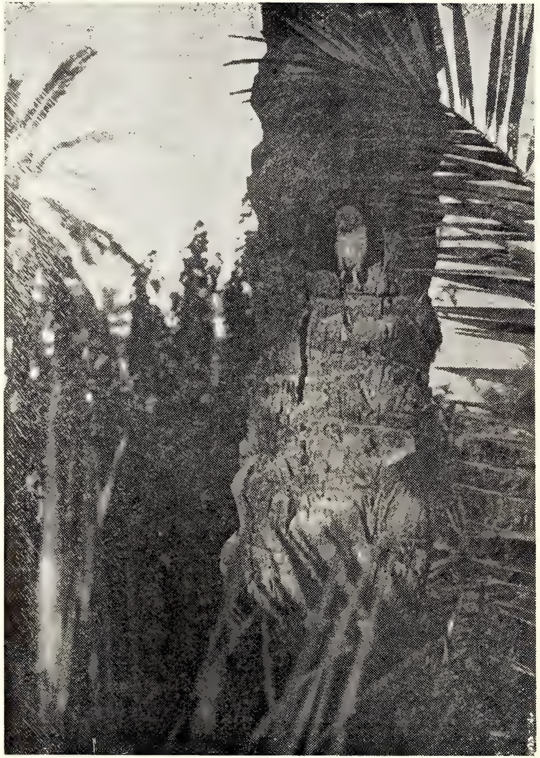
Wood Lark. Lullula arborea pallida Zar. Small flocks at Dohuk on November 14.

Lesser Short-toed Lark. Calandrella rufescens (=*minor* auct).

1. *Calandrella rufescens minor* (Cab.). As was suspected (vol. xviii, p. 225) a short-toed lark breeds in Iraq. Cheesman found a few pairs breeding near Baghdad and on June 5 discovered a nest in a cup-shaped hollow in the ground under a branch of dwarf *Acacia stephania*. The nest was made of fine grasses interwoven with wool and native thread ; it contained 3 incubated eggs ; another nest with 4 eggs in a similar situation on June 14. The eggs are greeny-white with sandy brown spots forming a ring at the larger end and measure 21 × 16 mm. The male soars high when singing ; when on the ground the birds often fly up to take insects on the wing.

The breeding bird obtained is of course very worn but it certainly seems to belong to this race. This bird was formerly called *C. minor minor* but if the Teneriffe Short-toed Lark is considered to be of the same species then *rufescens* must be the specific name.

2. *Calandrella rufescens persica* Sharpe (Cat. B. Brit. Mus. xiii, p. 590, 1890—Persia.) I overlooked the fact, until too late for publication, that there is in the Tring Museum a juvenile of this race from Fao obtained by Cumming. On the Jebel Sanam at Zobeir, on June 28, La Personne obtained a juvenile bird in rather worn dress which must belong to this race. It is certainly one of the *rufescens* group, sandy red above and with a large bill ; a female. W 85. It is exactly the same size as the above Tring bird.



Striated Scops Owl (*Otus brucei*). Baghdad

Nest and Three Eggs of Bifasciated Lark (*Alæmon alaudipes cinerea*) on Acacia. Aqquar Quf 5th June, 1922.

Photos by V. S. LaPersonne.

Lesser Short-toed Lark—(*contd.*)

In winter Cheesman obtained both *minor* and *heinei* in this locality, while in the British Museum there are two moulting birds from Fao, August 26, which are also *minor*.

Desert Lark. Ammomanes deserti.

1. *Ammomanes deserti cheesmani*. Meinertz. (Bull., B.O.C., xliii, p. 187, 1923—Shat-al-Adaim). Under the above name Col. Meinertzhagen has named birds from Shat-al-Adaim, Kasr-i-Sherin and Naft Kaneh, having compared with *fraterculus*, a smaller bill (14 mm.) a darker back and head and more rufous underparts. Having only seen the two birds from Shat-al-Adaim I did not feel justified in separating a race from that area especially as that area is almost surrounded by the areas inhabited by *fraterculus*—a very curious and local distribution.

2. *Ammomanes deserti coxi*, Meinertz. (Bull., B.O.C., xliv, 1923, p. 15—Syrian Desert, E. of Damascus). One obtained in October 30, in 40 10′E. 33 10′N. (west of Rutbah wells) belongs to this large form (M).

3. *Ammomanes deserti fraterculus*, Trist. The recent collection contains specimens from Feluja, Samarra and an area of the foothills east of Ali Garbi; up to a height of 2,300 feet in Pusht-i-Kuh. They are indistinguishable from *fraterculus*, W. 94–105. Bill from base 14–8 mm. I am very doubtful whether the alleged smallness in bill in *cheesmani* is a good character; I have seen Palestine birds (males) with bills varying from 14·5 to 17·5 mm. Occurs 20 miles W. of Ramadi (M).

Bifasciated Lark. Alæmon aiaudipes cinerea, Zar. (= *pallida* auct)

The *Alæmon* is by no means confined to the desert west of Euphrates. Cheesman met with it on the plains to the east of Ali Garbi in October, at Qarradah and at Aqqar Quf near Baghdad and on the east side of the Iskandariyeh canal in the breeding season. On June 5, a nest was found in the top of a dwarf acacia a foot high at Aqqar Quf; it was composed of thorny twigs and lined with cottony heads of desert flowers and contained 3 fresh eggs. 'The birds were very tame and came up to the nest within 10 feet of me but ran away when I approached nearer.' (R.E.C.) Another nest found the same day had 3 eggs nearly hatching. On June 11 another nest was found in the same locality containing two young, in this case the nest being built in a scrape under the shelter of a bush and droppings of the young lined the nest. Another nest on June 23 contained 2 young and 1 egg.

A pair were evidently breeding on Boonah Island (Fao District) on May 20. Occurs west to Rutbah Wells and beyond the Amman-Ramadi route (M).

The ground colour of these eggs is practically white, and there are numerous tiny specks or freckles of purple-black over the whole surface, more numerous and rather larger in a ring round the bigger end. The texture is close and fine, and there is a faint gloss. The shape is, as usual, long and rather pointed. They measure 26·0 × 17·2; 24·4 × 17·8; and 24·4 × 17·9 mm.

Shore Lark. Eremophila alpestris bilopha, Temm.

Common 5 miles west of Ramadi end of October (M).

Tree Pipit. Anthus trivialis trivialis L.

Obtained at Dohuk as late as November 1st.

Meadow Pipit. Anthus pratensis L.

Cheesman obtained it in the foothills east of Ali Gharbi on October 15. One at Baghdad December 25 (M).

Red-throated Pipit. Anthus cervinus Pall.

A flock not noted at Baghdad on May 14.

Tawny Pipit. Anthus campestris.

Anthus campestris griseus Nicoll (Bull., B.O.C., xli, p.25, 1920—Turkestan). Two obtained in the foothills east of Ali Garbi on October 6 belong to the eastern race; it was not uncommon.

Grey Wagtail. Motacilla cinerea.

Motacilla cinerea caspica (Gm.) (= *melanope* auct) (Reise d Russl., 811, p. 104, 1774—Enzeli.) A male obtained at Baghdad on December 23. Tail 93 mm. (M).

Blue-headed Wagtail Motacilla flava thunbergi, Billb.

A flock at Baghdad as late as May 14 on passage. Mostly females.

White Wagtail. Motacilla alba

1. *Motacilla alba dukhunensis,* Sykes. This race is evidently a fairly common winter visitor. Cheesman obtained two in November at Baghdad. Two at Baghdad and one in S. Kurdistan in December (M).
2. *Motacilla alba persica* Blan. A female obtained at Basra December 27, 1913 (M).
3. *Motacilla alba personata,* Gould (B. of Asia, iv, p.163, 1861—India). Two males obtained at Basra on February 4, 1914 (M).

Rock Nuthatch. Sitta neumayer.

1. *Sitta neumayer dresseri* (Zar. and But.) Common in the foothills east of Ali Gharbi (1,000–2,000 feet) in October. Cheesman found them very wild except when they were drinking at wells ; their loud bubbling note always attracted attention. An old nest was found in a circular cavity in a cliff 20 feet from the ground. It was a large oval mud patch 1½ feet wide, one foot high, the cavity one foot broad, the walls 1½ inches thick ; near the top was the circular bottle neck opening. 8 ♂♂ W. 89–94 once 98. B. exp. 23–25. 5. 6 ♀♀ 88–93 B exp. 22–25 mm.
2. *Sitta neumayer kurdistanica,* C.B. Ticehurst (Bull., B.O.C., xliv, p.28—Dohuk, Kurdistan. Common in the cliffs at Dohuk and especially on the Tang-i-Dorg also noted on the building of the Khasafir monastery. It is said to have quite a sweet warbling note ; compared with *dresseri* in same plumage these birds are a shade darker and have darker rust coloured flanks.

♂ W. 91–98 ; B. exp. 24–26. 5. ♀ W. 90 ; B. exp. 25 mm.

Two obtained and an old nest seen at Naft Khaneh in December, common at Kasr-i-Sherin (M).

Small Rock Nuthatch. Sitta rupicola tschitscherini, Zar.

La Personne states that this bird inhabits the same places as *S.n. kurdistanica* does at Dohuk where it is the less common of the two. He obtained one there on November 5.

♀ W. 77·5 Bill exp. 18·5.

Wall creeper. Tichodroma muraria. (L). (Syst. Nat. Ed., xii, 1766, p. 184, S. Europe).

Not uncommon on the cliff faces at Dohuk from October 25 onwards. Seen on the ruins of Nineveh near Mosul, January 20.

Great Tit. Parus major blanfordi, Prazak.

Common in gardens and ravines at Dohuk and at the Khasafir monastery. Noted at Mosul where specimens were obtained in January. 4 ♂ W. 76–80. 2 ♀ 73·5. Two seen at Kirkuk in December.

Sombre Tit. Parus lugubris.

1. *Parus lugubris dubius,* Hellm. (Journ. f. Ornith. 1901, p. 173—Persia.) Cheesman met with a pair in scrub near a spring at Fittak (1,000 feet) in the foothills east of Ali Gharbi on October 2 ; several pairs in the higher hills (2–3,000 feet) a few days later. 2 ♂♂ W. 72·5–74 Extra-limital subspeicies.
2. *Parus lugubris anatoliæ,* Hart. (Vog. Pal. F., p. 368—Ahoory Asia Minor).

Met with, chiefly in vineyards and hedges, in the neighbourhood of Dohuk, also at Khasafir monastery ; it avoids gardens and denser scrub. A pair were obtained ♂ W. 71 ; ♀ 69. These match well the type (in Tring Museum) and one other—all available for comparison.

Blue Tit Parus cœruleus georgicus. ? (But.) (Nascha Ochota, 1908, Oct., p. 5—Achalzich Transcaucasia.)

Found at Dohuk, generally in pairs on the hillsides and in the valleys; first noted on October 29 and became common later. Obtained at Mosul in January. Seen at Kirkuk in winter. Seven specimens obtained W. 63-67·5. Material is unfortunately lacking for the determination of what race we have represented here. The Dohuk and Mosul birds are the same. I have seen no *persicus* in the same state of dress, but these birds are yellower below and not so grey above as the *persicus* I have seen; they are not *orientalis* (E. Russia) since they are greyer above than this race; *raddei* again (N. Persia) is a smaller bird W. 60-64·5 (6 examined) and is greyer and paler on the back and paler below; of *georgicus* (Western Transcaucasia) and of *satunini* (Lenkoran, Kasvin, etc.) I have seen no examples (? the same) and so hesitate to describe another new (?) race. The Blue Tits of this part of the world very badly want working out but there is no material available to do so. There are three birds in the British Museum labelled 'Asia Minor' one of which is the same as our Dohuk birds; the other two are quite different again. Meinertzhagen refers his Mosul birds to the typical race; his series measures exactly the same as ours, viz. W. 63-67. The Mosul-Dohuk birds are a greyer green above and a shade paler below than Scandinavian birds and do not run so large, the latter measuring up to 70 mm. in wing.

Penduline Tit. Anthoscopus pendulinus persimilis, Hart.

Two seen at Gurmat Ali April 19, 1921 and party of 10 at Zorr on the Tigris November 12, 1922.

Great Grey Shrike. Lanlus excubitor aucheri, Bp.

Two seen at Ramadi on November 2 one at Mosul January 20 (M). Both races evidently over winter.

Masked Shrike. Lanius nubicus. Licht.

Noted as early as April 3 at Baghdad. No further confirmation of breeding. A late straggler at Baghdad on December 29 (M).

Red-backed Shrike. Lanius collurio, L.

Still common at Baghdad and Fao as late as May 13 and are at Shaiba on June 4 on passage.

Isabelline Shrike. Lanuis isabellinus. H and E.

In the former paper on Iraq, I stated on Dr. Bahr's authority, that the *Filaria* of this bird had the feather-louse for its intermediate host. I mistook what Dr. Bahr said; he only suggested to me that it might be so.

Red-tailed Shrike. Lanius cristatus phœnicuroides, Schal.

One at Babylon on November 8 (M) is somewhat late for this Shrike which unlike the preceding is a passage migrant in Iraq.

Grey Hypocolius. Hypocolius ampelinus. Bp.

Cox and Cheesman found a nest on May 16 near Baghdad in the centre of a bush of *Lycæum europæum* containing 4 eggs. The nest was composed of tendrils of a creeper with a few bits of wood inside felted with wool and rush seed neatly interwoven; diameter of the cup 84 mm. Besides the berries of *Lycaeum* mulberries, figs and dates are eaten. A breeding female lacks the usual black ends to the primaries and therefore presumably this species takes two years to become adult. Capt. Stanford found an unfinished nest at Baiji on May 10, an extension of range in Iraq, while Meinertzhagen records a small party at Mosul from November 23 to 26; a further extension. All evidence on further specimens tends to show that this species is frugivorous, a sequence being afforded by *Lycæum*, mulberry, fig and date. Four eggs measure 27·1 × 20·6, 25·6 × 19·4, 26 × 19·9, 24·6 × 19·5. The ground colour is pale greyish white, the faintly darker grey smears and blotches very pale and inconspicuous.

White-eared Bulbul. Pycnonotus leucotis mesopotamiæ, Ticehurst.

In a loosely constructed nest found on May 30 two eggs had fallen through the lining and 4 more eggs had been laid on top. A nest with 2 eggs at Fao on June 30, probably a second brood. Cheesman met with a few in Date Groves at Kunjamchem R (1,000 feet) and again at Barg-i-Gez (2,500 feet) in October, both localities in the foothills east of Ali Gharbi. These were isolated groves many miles apart. La Personne says that the Bulbul breeds in the reed beds of the Medina (Euphrates) marshes. Absent from Mosul and Dohuk, as also is the date palm.

Spotted Flycatcher. Muscicapa striata neumanni, Poche.

Return passage noted as early as August 13.

Pied Flycatcher. Muscicapa hypoleuca semitorquata, Hom.

Specimens were obtained at Baghdad March 7 to 30 and on August 14; at Fao March 27 and April 13. 4 ♂♂ W. 82–85. 2 ♀♀ W. 80. The females are greyer and the males have a more distinct speculum than in the typical race. A somewhat scarce passage migrant.

Chiffchaff. Phylloscopus collybita abietina. (Nils.).

An increase noted on February 21; males in song. Both races over winter at Baghdad; Meinertzhagen records the typical form at Mosul on January 2.

Willow Wren. Phylloscopus trochilus trochilus, L.

One at Baghdad May 22, a late migrant.

Phylloscopus trochilus eversmanni, Bp. One at Mosul December 1 (M).

Cetti's Warbler. Cettia cetti orientalis, Trist.

A recognizable race. Paler than the typical form and smaller than the eastern *cettioides*. Noted in reed beds at Gurmat on April 19. Cheesman found odd birds in gardens in the foothills east of Ali Gharbi, October 10–15 probably on passage to the plains.

Moustached Sedge Warbler. Lusciniola melanopogon mimica, Mad.

Several near Baghdad November 5.

Great Reed Warbler. Acrocephalus arundinaceus.

There can be little doubt I think that Great Reed Warblers breed in Iraq. At Qarradah near Baghdad on June 1, Cheesman found a bird singing in a fruit garden, there were no reeds or water in the vicinity, but it had been singing there for a fortnight previously; its organs were enlarged to breeding size. This bird is nearer to *A. arundinaceus* than to *zarudnyi*. Again on May 16 he found some at Zorr, and several in reed beds near Baghdad on May 7 but in these two cases evidence was not so suggestive, in fact in the latter case the birds were not there on June 25. Some of the birds obtained on these dates are *zarudnyi*; others are rather intermediate between these and the typical race.

Babylonian Reed Warbler. Acrocephalus griseldis (Hartlaub). (Abh. Nat. Ver. Bremen, xii, p. 7, 1891—Tanganyika).

After publication of the 'Birds of Mesopotamia' I found that *Acrocephalus babylonicus* is the same as *Calamoherpe griseldis* described from a unique specimen (in Tring Mus.) I have since seen this type from Nguru and another from Kilossa both in Tanganyika Territory, East Africa and allowing for the time of year they are identical with Iraq birds. The Babylonian Reed Warbler then breeds in a small area in Iraq and winters in a small area in East Africa so far as is known.

Cheesman found it breeding at Gurmut Ali on May 28, and took fresh eggs; on June 30, La Personne found most had flown, but got one clutch of two incubated eggs. It nests freely in the Medina (Euphrates) marshes. The nest of reeds and grasses woven round two reed stems is 3 to 4 inches in diameter. Two birds were taken on a boat of Bubyan. (Fao district) on April 22. Tomlinson records that a nest of this bird had been appropriated by *Crateropus altirostris*.

Common Reed Warbler. Acrocephalus scirpaceus scirpaceus (Herm.).

Several seen at Gurmat Ali April 19, one obtained at Babylon May 1. No evidence of breeding.

Marsh Warbler. Acrocephalus palustris (Bechst).

One shot by Sir Percy Cox in camel thorn scrub in the desert near Aqqar Quf on September 1. This is the first satisfactory record from Iraq.

Sedge Warbler. Arocephalus schænobænus (L.)

One obtained in the foothills east of Ali Gharbi on October 15, and one at Baghdad May 7, apparently a passage migrant.

Olivaceous Tree Warbler. Hippolais pallida elœica (Lind.).

Mr. Jourdain has suggested to me that clutches of six eggs for this bird are erroneous (as recorded xxviii, p. 277) it may be so—we have no further notes on such large clutches.

Icterine Warbler. Hipolais icterina (Viellot). (Nouv. Dict., p. 194, 1817—France).

One was shot by Sir Percy Cox in the Iron Bridge Garden at Baghdad on May 19, 1922.

Barred Warbler. Sylvia nisoria (Bechst).

Cheesman found the Barred Warbler not uncommon in mulberry trees on May 8, seen on return passage on August 29.

Orphean Warbler. Sylvia hortensis.

Sylvia hortensis crassirostris, Cretzschm. (Atlas Reise Ruppells, p. 49, P. 133 figa, 1826—Syria). One was obtained on April 3 at Baghdad.

Garden Warbler. Sylvia simplex, Latham.

The late passage of the Garden Warbler is confirmed ; it was noted till May 23. Since writing the ' Birds of Mesopotamia ' I have been able to examine a series of spring birds from Yenesesk in Siberia and these do not differ from British ones. Some of the Iraq birds are however decidedly greyer on the upper parts than British ones ; *pallida* described from Barnaul and Kainsk, 700-800 miles S. W. of Yenescisk ; some of the Iraq birds are paler than others.

Common Whitethroat. Sylvia communis icterop Menetr.

One at Baghdad on May 24, organs very advanced, it probably breeds in the higher lands at no great distance away. One taken on board off Fao April 16.

Blackcap. Sylvia atricapilla atricapilla (L.)

Not uncommon at Dohuk October 17, last seen November 1, noted by Meinertzhagen at Mosul up to early December.

Desert Warbler. Sylvia nana nana (Hemp. and Ehr.)

One in the British Museum from Fao March 19, 1896.

Menetries' Warbler. Sylvia mystacea, Menetr.

Noted in the foothills east of Ali Gharbi up to 1,500 feet October 4 to 9. Seen at Zobeir February 28.

Cheesman found nests with four (June 9) and five eggs on June 20 somewhat late and five is an unusual number. One on board off the Shat-al-Arab L.V. on March 29.

Spectacled Warbler. Sylvia conspicillata conspicillata, Temm.

(Man. d'Orn, 2nd ed. i, p. 210, 1820-Sardinia). One obtained in a grass field at Baghdad by Meinertzhagen on January 11, an addition to the Fauna (M).

Sardinian Warbler. Sylvia melanocephala melanocephala, Gm.

(Syst. Nat. i, 2, p. 970, 1788—Sardinia). Not uncommon at Mosul ; specimens obtained January 1 and 21, 2♂ W.57 and 58 T.62·5. These are typical *melanocephala* and not *momus*.

Eastern Rufous Warbler. Agrobates galactotes familiaris (Menetr.)

Cheesman found a nest at Baghdad 6 feet up in a fork of an apricot; he notes that most nests contain pieces of snake skin which are added loosely after the nest is finished. It has been suggested to me by Mr. Jourdain that a clutch of 5 eggs is extremely rare; I do not think it is as rare as he thinks. As Mr. W. D. Cumming had paid special attention to the nidification of this species I asked him to send me any notes he had on it and this he has kindly done. He informed me that, though 4 is the usual number, but he personally had seen a fair number of nests with 5 eggs. He further stated that he had once found a nest in a hole in a telegraph post, and once found a nest used for two broods. Another nest he found had been begun by the *Hypocolius* and abandoned and then finished off by this Warbler. Both sexes build but only the female incubates. The young are fed on grasshoppers and caterpillars.

Streaked Wren Warbler. Prinia gracilis.

Prinia gracilis irakensis. Meinertzhagen (Bull, B.O.C., xliii, p. 147—Baghdad). Described as being near *palestinæ* darker upper parts with broader centres to the feathers. Subterminal black and white bar on the tail less distinct. When I first obtained this bird at Basra in 1918, I thought it to be different to *lepida* but found the darkness of the upper parts to be largely due to dirt, others from elsewhere in Iraq did not seem to be very different to *lepida* but the series was in very bad order. *Prinias* were noted at Mosul in January. A bird from Bushire is *lepida*, one from Fao is *irakensis* but another thence seemed to be nearer *lepida*. *irakensis* occurs at Kirkuk (M).

Fan-tailed Warbler. Cisticola juncidis neurotica, Meintz.

(Bull. B.O.C., xli, 1920, p. 25—Sidon.)

Found plentifully in beet-fields near Baghdad by Col. Meintzhagen on January 1. Only one skin received and that is moulting so it is still impossible for me to say what race inhabits Iraq. A series from Baghdad do not differ from Palestine birds (M).

Mesopotamian Babbler. Crateropus altirostris, Hart.

A nest at Fao on May 3, is described as composed of coarse reeds and date-palm leaves on the outside and lined with fine date fibre; diameter of the cup 3¼ inches; it contained 4 eggs. Common at Fao; further additional localities—Busra, Gurmet Ali, Abu Aran, Shafi; like *huttoni* it is said to inhabit reed beds too.

Hutton's Babbler. Crateropus caudatus huttoni (Blyth).

Found in the foot hillls in bush covered desert east of Ali Gharbi and in gardens up to 1,400 feet.

Song Thrush. Turdus philomelos philomelos, Brehm.

Common at Dohuk in winter. Meinertzhagen says that Mesopotamian Song-Thrushes run large W. 119–123 (M). Possibly they average longer in wing but I find many of the typical race in W. Europe are between these measurements, though some are smaller.

Blackbird. 1 Turdus merula syriaca? H and E.
2 Turdus merula intermedius. Richm.

The Blackbird is a not very uncommon winter visitor round Baghdad from the end of November to the end of February. Common in gardens at Dohuk and Mosul in winter.

The determination of the race or races is very difficult. I have examined a series of *aterrina* and *syriaca* in the Tring Museum and except that the former seems perhaps to have a slightly shorter tail I can see no difference in measurements. The larger bill of *syriaca* is not apparent.

Added to the difficulty is the fact that these *syriaca* are not breeding birds and so one does not really know that they are the resident bird at all. As regards colour both are dull black in the males and the females are so variable that no distinctive character stands out.

The Iraq series measure 7♂♂ W. 127–134; T. 106–115; Bill from base 24.5–29 mm. 4 ♀♀ W. 123–127 T. 107–109; Bill from base 25–27 mm.

Meinertzhagen obtained a pair of *T. m. intermedius* at Feshkabur (M).

Rock Thrush. Monticola saxatilis (L).

A few passed through Baghdad on May 4 to 17 ; noted at Fao April 30 and May 9.

Blue Rock Thrush. Monticola solitarius longirostris, Blyth (= *transcaspicus* auct).

Seen at Zobeir on February 28, and in the foothills east of Ali Gharbi (1,200 feet) October 2, fairly common on the hills above Dohuk. On passage at Fao March 28, to April 22, single birds. Specimens from all these places are, I think, *longirostris* ♂ W. 120–125. ♀ W. 119–122.

Common Wheatear. Ænanthe ænanthe.

Ænanthe œnanthe rostrata. (H and E) (Synib Phys., i, fol. 2. a.a., 1832—Upper Egypt).

Further examination of Asiatic Wheatears leads me to think that there is one recognizable race characterized by the paleness of upper parts and wing-edges in both sexes and by a longer wing. Many of the Iraq birds stand out at once by the paleness and such birds I have never seen in Western Europe. The wings of the Iraq males measure 97–102 mm. which is an average longer wing than in West European birds. The length of bill is very variable in both eastern and western birds, Iraq males vary from 17 to 19 mm. The paleness of the wing-edges is noticeable in autumn also. I am not however convinced that *two* Asiatic races can be upheld and therefore I use the older name *rostrata* instead of *argentea.*

Black-eared Wheatear. Ænanthe hispanica.

Ænanthe hispanica melanolenca. (Güld) Still plentiful in the foot hills east of Ali Gharbi on October 16, extreme dates of spring passage at Baghdad April 3, and May 14, on the latter date a bird had its organs well advanced. Noted at Fao as early as March 26.

Barnes' Wheatear. Ænanthe finschii barnesi. (Oates).

Meinertzhagen (*Ibis*, 1924, p. 615) considers that *barnesi* (Baluchistan) is not separable from *finschii* (N. E. Africa). At present I prefer to keep these separate. Baluchistan males are much longer in wing (up to 96 mm.) whereas the few Egyptian males I have seen are under 90 mm. Baluchistan females are on the mantle sandier brown, not so grey, and I have never seen any females with the black throat thence such as Egyptian birds shew ; also in Egyptian females the axillaries are black edged with grey instead of dark grey edged with isabelline as in Baluchistan birds, and have darker ear coverts and whiter underparts.

All the females I have seen from Iraq have greyish throats but Meinertzhagen has seen females with black throats. It is possible therefore that both races occur ; these chats are so far as we know winter visitors to the Iraq plains. The Iraq birds do not it is true attain quite the large dimensions of some Baluchistan ones and it is more than likely that they are come from an area where intergradation of the two races occurs but as they appeared to be nearer the Baluchistan races than the Egyptian I retain them under the above name.

Red-tailed Wheatear. Ænanthe xanthopyrymna.

1. *Ænanthe xanthoprymna xanthoprymna.* (H and E). One obtained on Dohuk Dorq on October 19, (2,000 ft.). Red-tailed Wheatears were seen at Chasmeh Sherin in the hills east of Ali Gharbi on October 12. Some were seen W of Ramadi,(41° 45′ E. 33° 15′ N.) on October 31 (M).

2. *Ænanthe xanthoprymna cummingi.* (Whit.). A female was obtained on Tang-i-Dorq, Dohuk on October 23.

Hume's Wheatear. Ænanthe alboniger. (Hume).

Seen here and there in the foothills east of Ali Gharbi in October. Specimens obtained near Kunjam Chem R. (1,100 ft.), October 16. Obtained at Naft Khaneh on December 20 (M).

Mourning Wheatear. Ænanthe mœsta.

Ænanthe mœsta brooksbanki, Meinertzhagen. (Bull., B.O.C., xliii. 1923, p. 147—El. Jid, N. Arabia) Occurs at Rutbah Wells within political Iraq, 40° 15′E. 33° 5′N, on the Amman Ramadi route (M).

Stonechat. Saxicola torquata.

Both *ubicola* and *maura* were obtained at Dohuk in October and our records for both races range from the extreme north to the extreme south in winter.

Winchat. Saxicola rubetra noskœ (Tsch.)

Five more specimens obtained, from Diala R. in the north to the head of the Persian Gulf on passage ; all are of this race and I rather doubt the typical form occurring. Noted as late as May 14 at Baghdad.

Common Redstart. Phœnicurus phœnicurus.

1. *Ph. ph. phœnicurus* (L). A few must winter as already suggested ; one obtained at Mosul on January 13.
2. *Ph. ph. mesoleuca* (H and E). Some arrive very early, one at Zobeir on February 28 and at Baghdad on March 4. Two females Baghdad May 13 and Fao June 30 appear to belong to this race being greyer above than the typical form ; another, Fao, March 30 shows white wing edges as in the male. There is no evidence that it breeds at Fao. One obtained at Dohuk on October 17.

Black Redstart. Phœnicurus ochruros phœnicuroides (Moore).

One from Baghdad in December is the first record in that area. Meinertzhagen considered it to be the predominant race there (M).

Nightingale. Luscinia megarhynchos africana (Finsch and Reich).

A summer visitor breeding not uncommonly at Baghdad in gardens, etc. Nest with 2 eggs on May 22 another with 5 eggs June 1. Nests placed at the side of young date palms made of and lined with palm fibre. The eggs are greener than in the typical race and more inclined to spotting.

Thrush Nightingale. Luscinia luscinia (L).

Only noted as spring passage migrant in the last week of April.

Bluethroat. Luscinia suecica magna. (Zar. and Loud.).

This race arrives back regularly in the middle of August and must be a passage migrant only ; all records refer to August and September. March and April ; *volgæ* is the winter visitor and is not uncommon at Dohuk, Baghdad, etc.

Robin. Erithacus rubecula.

A series from Dohuk. Baghdad. Hills east of Ali Gharbi are *caucasicus* ; one from Dohuk is *hyrcanus*.

White-throated Robin. Irania gutturalis (Guerin).

Evidently commoner on passage than supposed ; several at Basra April 13 and Baghdad April 24 to May 9. Common at Amara early in April (Home). Cheesman saw one on a wire fence 'fly catching,' forsaking its usual skulking habits. One on August 2 is the first and only autumn record.

Hedge Accentor. Prunella modularis.

Prunella modularis orientalis (Sharpe) (Cat. B. Brit. Mus., vii, p. 652, 1883—Batoum).

The Hedge Accentor is common in vineyards and hedges at Mosul in winter; common too at Dohuk in December. These agree well with *orientalis* from Transcaucasia ; *blanfordi* from Ispahan I have not seen but these do not agree with the description of it. 7 spec. W. ♂ 71–72 ; ♀ 68–70. Second primary exceeds the seventh by 0·5 mm. Occurs at Zacho and Feshkabur commonly in December (M).

Alpine Accentor. Prunella collaris.

Prunella collaris caucasicus (Tsch.) (Orn. Monat., p. 186, 1902—Vladicaucasus). The Alpine Accentor was common in Tang-i-Dorg (Dohuk), in winter in small flocks, sometimes with *Petronia p. exigua* These agree well with *caucasicus*. W. 92–102.

Wren. Troglodytes troglodytes.

Troglodytes troglodytes hyrcanus Zar. and Loudon (Orn. Monat., p. 107, 1905–S. Caspian). The wren was obtained at Baghdad on November 17 and again at Mosul, January 18 ; seen at Kirkuk, rare in the plains ; at Kasifir Monastery it was not uncommon on November 9 and also at Mangesh, Dohuk area. These are not as pale as *pallidus* and not so warm rufous as the typical form and more barred above and below. They resemble a series from Vladicaucasus. Common in winter at Mosul (M).

Common Swallow. Hirundo rustica.

Hirundo rustica rustica, L. Seen migrating over the mountains at Chasmet Sherin, going south in flocks on October 12. Arrived back at Baghdad as early as February 12.

Red-rumped Swallow. Hirundo daurica.

Hirundo daurica rufula, Temm. Cheesman found what was evidently an old nest of these birds in a cave in a cliff by the Changulac R., east of Ali Gharbi. It held a rotten egg, white with slight gloss 20·5 × 15 mm.

House Martin. Delichon urbica.

Delichon urbica meridionalis. (Hartert) (Vog. Pal. Fauna, p. 809—Algeria.) A pair were seen at Aqqar Qaf on February 23 and six noted flying north at Diala R. over the desert on April 28. A male obtained. W. 104. Like all eastern birds this has a short wing. Two races of House Martins are described *meridionalis* (Algeria) and *alexandrovi* (Pamir, Turkestan) which only differ from the typical race in being slightly smaller. It would seem that Iraq, Persian and N. W. Indian birds are all shorter winged than the typical form and so until one can see whether Zarudny's *alexandrovi* is really distinct. I leave this race under Hartert's name ; it appears to have a wide distribution.

Pale Crag-Martin. Ptyonoprogne obsoleta obsoleta, (Cab.).

One from Fao in the Brit. Mus. collected by W. D. Cumming.

Syrian Woodpecker. Dryobates syriacus H and E.

Cheesman found a few pairs in oak forest in the hills east of Ali Gharbi 3,000 ft. (Pir Mahommadi, Fittack, etc). Found here and there at Dohuk where it was also noted on cliff faces. Had formerly been recorded from Urfa which is outside Iraq territory. Common at Mosul, Dohuk and Zakhor in December (M).

Middle-spotted Woodpecker. Dryobates medius.

Dryobates medius sancti-johannis (Blanford) (Ibis, 1873, p. 6—Shiraz).

This Woodpecker was found here and there at Dohuk. The single specimen seems to belong to this race.

Wryneck. Jynx torquilla torquilla. L.

A few must remain over winter as two were obtained at Mosul on January 9 ; not very uncommon on passage.

Cuckoo. Cuculus canorus.

Cuculus canorus subtelephonus. Zarudny. (Mess. Orn., 1914, p 108—Turkestan.) The Cuckoo was seen at Dohuk as late as October 26. A not uncommon passage migrant through the Iraq plains in April and September. When I wrote the *Birds of Mesopotamia* I had only seen a pair of adults ♂ 232 ♀ 212. The latter collection contains four adult females and these are easily picked out from a series of European birds by the paleness of the upper parts and throat. The fine barring of the underparts and small size. W. 190-206. They are smaller than *telephonus* and appear to agree well with Zarudny's description of *subtelephonus* ; similar birds I have seen from Bushire and Karman in S. W. Persia, from Ala Kul, Karakol on the Oxus, Vernoi, Tian Shan and Yarkand in Turkestan, and from Baluchistan obtained in May and July. (♂♂ W. 209-222 ; 4 ♀♀ 195-206. Two birds from Samarkand however are quite different, large, dark and coarsely barred and appear to belong to the typical form, these were obtained on May 6 and were very likely on passage. It appears to me therefore that there is a belt of country through Central Asia from W. Chinese Turkestan westward which is inhabited by a small pale Cuckoo whose

Cuckoo—(*contd.*)

distribution may reach to the highlands of Persia. The typical race occurs also in Iraq on passage.

Pallid Swift. Micropus murinus murinus (Brehm.).

Apparently very local. Seen at Zobeir on February 28, and at Baghdad where a few pairs bred in a ruined mosque but not elsewhere in the city. One of these obtained belongs to this form and the suggestion that *pekinensis* also breeds in Baghdad (xxviii, p. 298) is not proved.

Great Spotted Cuckoo. Clamator glandarius (L) (Syst. Nat., Ed. x, p. 111, 1758-Gibraltar)

One was obtained at Baghdad on July 7, 1922. Status unknown, passage migrant ? The first record in Iraq proper.

Nightjar. Caprimulgus europæus.

Caprimulgus europæus meridionalis Hartert (Ibis, 1896, p. 370-Greece.)

One which I refer to this race was obtained at Zorr near Baghdad on May 16. Further examples of *zarudnyi* and *unwini* were obtained on passage. One of the former on Boonah Is. on May 20.

Egyptian Nightjar. Caprimugus ægyptius ægyptius, Licht. 'Milahiyeh Alrayan.'

A nest with two eggs on July 16, is a late date.

Common Bee-eater. Merops apiaster, L.

Cheesman has seen this Bee-eater settle on the water to drink.

Persian Bee-eater. Merops persicus persicus, Pall.

Seen at Zobeir as early as February 28. Cheesman observes that the male feeds the sitting female and that in a colony eggs may often be found on the bare ground laid by birds whose holes are not fully excavated.

Hoopoe. Upupa epops epops, L.

Several at Zobeir by February 28. Breeds in Mosul and leaves in October.

Pied Kingfisher. Ceryle rudis rudis, L.

Found in the streams in the hills east of Ali Gharbi.

White-breasted Kingfisher. Halcyon smyrnensis smyrnensis, L.

Hilla and Khanikin are added as winter localities for this species (M).

Indian Roller. Coracias benghalensis benghalensis. (L).

Nest with two eggs at Fao on June 11. Noted up the Euphrates to Nasiryeh. (M).

Eagle Owl. Bubo bubo ruthenus (But. and Zhitkov.)

The Eagle Owl though local is commoner than it was thought to be, and further specimens were obtained from Abu Ghraib and Aqqar Quf near Baghdad, Kirkuk and Tybi River in Luristan. In all I have examined six males, three females and three unsexed ; all appear to be the same and resemble birds from Trebizond. ♂ W. 415-440 ; ♀ W. 440-480. Zarudny's small race *nikolskii* (Arabistan) is still shrouded in mystery but I may remark that a bird from Bushire is large (W. 440) and resembles the rest of our birds.

A bird from Kirkuk on February 16 was almost in breeding condition. Cheesman notes that one he disturbed from a canal bank flew out into a ploughed field and squatted like a hare.

Fish Owl. Ketupa zeylonensis.

Ketupa zeylonensis semenowi, Zar. (Orn. Jahrb., xvi, p. 141, 1905-Arabistan). Cheesman obtained a pair out of a cave at Basha Daraz in the hills east of Ali Gharbi (1,300 ft.) on October 19. It is presumably resident. I keep these for the present under Zarudny's name, though they do not seem very different to the North Indian *leschenault* ; and these two are practically topo—types of *semenovi* ; a larger series is needed to settle the point. ♂ W. 423 ; ♀ 405 mm. Extra limital species.

Striated Scops Owl. Otus brucei (Hume).

Resident and breeds round and in Baghdad and at Hilla, not very uncommonly, also at Basra. A pair which bred in the Residency garden had young on the wing on July 6. Another pair in Baghdad had a nest in a hollow date palm, the hole being eighteen inches deep ; this pair became very tame and used to come down on to the mess table at night and catch moths and mole crickets attracted by the electric light. In the nest were the remains of House Sparrows. The young in the nest make a sort of wheezing noise ; the old birds start booming in the first days of March. A nest at Hilla contained five eggs on April 27 ; this nest too was in a date palm, twenty feet up. The eggs measure 31 × 25 mm.

Long-eared Owl. Asio otus.

Asio otus otus, (L.). One in camel thorn bushes on the desert near Baghdad on January 14.

Little Owl. Athene noctua bactriana, Hutton.

Palestine and Iraq Little Owls vary considerably. If *lilith* be a good race, (and the types from Deir-ez-Zor between Dair and Aleppo on the Euphrates seemed to me to be distinct, although unique), then it must be a local desert race ; for the birds from Palestine (Lebanon, Judaea, Tabor, Kutifah N. of Daur) I cannot separate from Kandahar birds (*bactriana*). The recent series from Iraq vary much in colour according to the time of year and not a little individually. One from the Jebel Hamrin at Abu Ghraib is nearly as dark as *glaux*, birds from Dohuk are nearer *bactriana* but darker, paler than *glaux*. The feathering on the toes varies much ; fresh-moulted birds are always more feathered, worn ones more bristly. A fresh-moulted bird from Damascus is *fully* feathered on the toes.

Tawny Owl. Strix aluco.

Strix aluco sanctinicolai (Zar.) (Orn. Monat., 1905, p. 49—Bactiara in W. Persia). Three Tawny Owls were secured at Dohuk in December in large shady trees in gardens and nullahs. These are paler grey than the greyest British form, no trace of brown at all in the plumage ; abdomen whiter. They quite resemble Mr. Witherby's birds from S. W. Persia. Two males measure W. 266-270 female 255 mm. The fourth primary is just longer than the fifth which is just longer than the third. Possibly the sexing is wrong ?

Barn Owl. Tyto alba alba (Scop).

A nest with large young in a roof of a house on June 28. A series from Baghdad and Feluja were obtained. These vary in colour but none is rusty below, all being white ; three being spotted with black and three not. On the back the amount of grey varies much, one bird in its greyness above and spotting below approaches very near to *guttata* but the whole series can be matched with British birds. In the *Bull, B. O. C.*, xliii, p. 24 Mr. P. L. Sclater names the South Arabian Barn Owl as *erlangeri* distinguished by its paleness and by having the tarsi and toes almost bare. He assigns birds from Babylon to this race ; our series however do not bear out this determination and I cannot differentiate Iraq birds from British ones.

Saker Falcon. Falco cherrug.

These falcons, which are much used for falconry in Iraq, are known by various names according to the districts in which they are taken—viz., *Hurr al Hamar*, *Hurr al Farsi*, *Hurr al Badree*. Hawks of any kind taken as downy young are *Wachere* ; birds of the year taken in nets *Lafeef*, birds after first moult *Holee* and after second moult *Jernaas*.

Capt. Stanford informs me that a pair of Falcons which he thought were certainly Peregrines nest in a high cliff at Tekrit, they lived on Rock Pigeons and could take Sand grouse in full flight ; they were perhaps Sakers which are said by Arabs to breed in the Jebel Hamrin in the Diala area. Common round Mosul in winter (M).

Merlin. Falco æsalon.

Falco æsalon æsalon, Tunst. (Orn. Brit. i, 1771-England) Meinertzhagen says that Merlins are common round Mosul in winter and of the specimens he

Merlin—(*contd.*)

obtained one belongs to the typical form, one is *insignis* and three are *pallidus*. He obtained another *pallidus* at Babylon (M). We have *insignis* from Dohuk and Baghdad.

Imperial Eagle. Aquila heliaca.

Aquila heliaca heliaca, Sav. Frequently seen at Baghdad, Mosul and Erbil in winter; a male shot at Baghdad had been feeding on a Chukar, the bird must have flown some distance as there is no chukar ground nearer than forty miles from Baghdad (M).

Steppe Eagle Aquila nipalensis.

Aquila nipalensis orientalis Cab. (J.F.O., 1854, p. 369—Volga). Apparently common at Baghdad in winter (M).

Tawny Eagle. Aquila rapax.

Tawny Eagles noted near Ramadi on November 1 (M).

Marsh Harrier. Circus æruginosus.

Circus æruginosus æruginosus (L). Nests were found at Babylon with one egg on May 1 and at Hindeyah Barrage with one and four eggs on May 29.

Sparrow Hawk. Accipiter nisus.

Accipiter nisus nisosimilis (Sick). Probably common as a winter visitor, four specimens obtained. No confirmation has been obtained of any Sparrowhawk breeding in Iraq.

Black Kite. Milvus migrans.

Milvus migrans migrans, Bodd. Black Kites leave Baghdad between April 17-24; they are common at Mosul in winter but none is at Dohuk at that season.

Large Black Kite. Milvus lineatus (Gray).

A female obtained near Baghdad on January 20, W. 513.

Honey Buzzard. Pernis apivorus apivorus (L).

One obtained at Boonah Is on June 10; organs slightly enlarged. It must have been a straggler on passage.

Griffon Vulture. Gyps fulvus.

A party of 15 seen near Ramadi on November 1, and some near Zakho and Dohuk in December (M).

Cinereous Vulture. Ægypius monachus (L). (Syst. Nat. Ed. xii, p. 122, 1766—Arabia).

Three seen fifteen miles W. of El. Jid on the Amman-Ramadi route on October 29. (M).

Lammergeier. Gypaetus barbatus.

Three seen in the hills east of Ali Gharbi on October 11 (2,500 ft.) by Cheesman. Frequent at Zakho and Dohuk in December. (M).

Egyptian Vulture. Neophron percnopterus percnopterus (L) 'Khomer'.

The date of nesting (xxviii, p. 315) should be May 20.

White Pelican. Pelecanus onocrotalus. 'Naj-al-mai'.

Pelecanus onocrotalus onocrotalus L. Sir Percy Cox made every endeavour to clear up the status of Pelicans in Iraq and sent his collector, La Personne, on several trips to likely breeding grounds. From information sent to me by the late Mr. W. D. Cumming it appears that he found Pelicans breeding on the creeks between the Khor Musa and the Khor Bunder in 1884. Another breeding place was between Dohuk and Khor Dhawir.—Bunder has grown in importance since 1884 owing to the demand for rock and sand for building purposes and when La Personne visited Mr. Cumming's localities no signs of

White Pelican—(*contd.*)

any Pelican colonies were to be found. It was probably from one of these localities that Mr. Cumming obtained the *crispus* chick referred to (xxviii, p. 325). La Personne was more fortunate on Bubyan Island. On his visit there on April 18, 1922, adults were seen also a few young in down ; on one part of the island the carcases of about 100 adults and twenty young in down were found and it appeared that some epidemic had swept off most of the colony. On another islet near by more dead adults and young were discovered. On visiting this islet again on April 1, 1923 it was found that at highwater not more than six inches of land stood above water and the area therefore was much reduced ; on this the pelicans were nesting ; very slight nests were made. A good many eggs and young were seen and again a number of dead birds. Two adults were obtained for identification with difficulty, owing to their extreme shyness recourse had to be made to lying up at night for them. The young in down walk with difficulty but swim with expert ease. When being fed they reach so far down the parents, gullet that little remains visible outside the parents' bill except their legs kicking in the air.

According to Arab testimony Pelicans used to breed on Boonah and Warba Islands sixteen to twenty years ago. Pelicans were seen with fully grown young on the Barmanshir River on June 10, 1921 and near Abadan Island June 27. The adults from Bubyan belong to the typical race as also one from Fao May 22. ♂ W. 700 mm. ; Bill from gape 17 inches.
♀ W. 635 and 640 mm. ; Bill from gape 14 inches.

Common Cormorant. Phalacrocorax carbo.

Noted on the Tigris at Mosul and Feshkabur and at Khanikin (M).

Pygmy Cormorant. Phalacrocorax pygmæus (Pall.).

In the Medina marshes, Euphrates, at Beni Mansur (twenty miles north of Medina) the Pygmy Cormorant was found breeding in large numbers on July 12. The water here was four to six feet deep and the dense reed beds fourteen feet high. Here the colonies of Cormorants were nesting on the broken down reeds in clusters occupying a space of about 200 square yards and, of all the water birds nesting there, were only outnumbered by Night Herons. The nests were about 4 feet above the water and mostly held three to five eggs but one nest contained four eggs and three young. Similar colonies were found near Anzha village in the Rotha Marshes (sixteen miles from Qurnah on the Tigris) on July 23. Cormorants were breeding in vast numbers together with Darters and Ibises. Noted on the Lesser Zeb. R. in winter (Kirkuk area).

Though especially looked for, Cheesman was unable to verify the reported occurrence of Shags on the Tigris.

African Darter. Anhinga rufus (Lacep).

A few were found nesting at Beni Mansur amongst the colonies of herons and Pygmy Cormorants on July 12, the nests were placed on broken down reeds in reed beds fourteen feet high and four to six feet above the water. The nests contained mostly three eggs. In the Rotha marshes, in the same place as described above, they were nesting in great numbers.

An examination of two more Iraq specimens confirms what I said before—that the Iraq bird is not separable from the East African.

Red-breasted Goose. Branta ruficollis, Pall. (Spicil. Zool. fasc., vi, 1769, p. 21. tab iv. N. Siberia).

Pitman's and Thornhill's suspicions have been fully confirmed. *B.N.H.S. Journal*, xxx, p. 228 Major O. G. Kiernander records that a single adult was obtained at Abu Jisra on February 17, 1924.

Grey Lag Goose. Anser anser (L) ' But.'

Meinertzhagen considered this goose to be commoner south of Baghdad, *albifrons* the commoner north of that city. (M).

Common Shelduck. Tadorna tadorna (L) ' See-nee '.

Gadwall. Anas stepera (L) ' Chesham '.

Pintail. Anas acuta. (L) ' Hosha '.

Mallard. Anas platyrhyncha. (L) 'Khedary'.

Cheesman saw a pair in a wood near Baghdad on May 16, and he felt certain that they were breeding there.

Marbled Duck. Anas angustirostris Menetr.

In the same wood Cheesman saw five or six pairs of Marbled Teal. Noted in winter on the Diala R. but not at Mosul.

Teal. Querquedula crecca (L) 'Hadaf.'

Golden Eye. Glaucion clangula (L).

Two at Baiji and Mosul in winter.

Smew. Mergus albellus (L).

Diala, March ; Mosul, February.

Merganser. Mergus serrator (L) (Syst. Nat. Ed. x, p. 129, 1758—Sweden).

Sir Percy Cox met with a pair at Gubban and one in the Khor Khanaki at the head of the Persian Gulf on May 22, 1907.

Flamingo. Phœnicopterus ruber antiquorum, Temm.

On May 21, 1921. Flamingoes were seen on Bubyan Island and a rotten egg was picked up. On April 7, 1922, a colony of about 500 pairs was located on Bubyan up the Khor Milah nesting on a slightly raised stretch of sand covered with low scrub. The nests, situated on bare dry sand within a foot of each other and just above high water mark, were either mounds of sand raised above the level or else the egg was laid on the level sand and the surrounding sand scooped away leaving the egg on the mound. The nests measured one foot in diameter and contained one egg, rarely two. When on the nest the scapulars are raised up in the form of a fan ; the nearest approach to the sitting birds was 100 yards. Subsequently the colony deserted and by May 30, had laid again in another part of the Khor but most of the eggs had been washed away by a big tide. The young in down swims with ease. On April 1, 1923, no Flamingoes were seen on Bubyan.

Common Heron. Ardea cinerea cinerea L.

On May 21, 1921 and May 30, 1922, the Common Heron was found nesting amongst a colony of *Demiegretta asha* on a ridge covered with salt bush on Bubyan Island. The nests were either built on the bushes, or on the bare ground in which case they were considerable structures. On April 1, 1923, the birds had just begun to lay, two nests containing single eggs. It was found breeding on Warba Island in May 1906 by Sir Percy Cox and several nests with three or four eggs were found there on May 19, 1921.

Goliath Heron. Ardea goliath, Cretzschm.

I have now been able to examine one fully adult female, one sub-adult, no sex, and one half-grown young one from Iraq ; the two grown birds measure :

Ad. W. 580 ; bill from angle of forehead feathers 177 ; Ts. 235 mm.
W. 540 ,, ,, ,, ,, ,, 175 ,, 205 ,,

They are not distinguishable either in colour or size from birds from East Africa, whence came Cretzschmar's type. In the British Museum there is only one adult from the west side of Africa, also a female, and this is a noticeably smaller bird with a darker chestnut head and neck and underparts and darker blue on the back, it was obtained in Portuguese Guinea. It measures W. 510, B. 157, Ts. 190 mm. It will probably be found that this is a well-marked race but I do not care to name it on one specimen.

Reef Heron. Demiegretta sacra asha. (Sykes).

On Bubyan Island four colonies were located. The blue and white phase was noted in each colony and about in the proportion of three to one. One colony consisted of about 25 nests built on the salt bushes just above high water mark

Reef Heron—(*contd.*)

and on April 18, 1922, mostly held three eggs in each. On April 1, 1923, building had commenced. Similar colonies were found by Sir Percy Cox on Warba Island on May 30, 1906, the blue phase again predominating while other colonies were located up the Khor Khannaka and Khor Musa, May 24, 1907. A colony up the Khor Bunder consisted of 20–30 pairs of birds mostly of the white phase. On Gabr-un-nakoda a good many pairs were nesting on May 28, 1923, here blue and white phases again were in the same colony and after watching the nests for 3 days La Personne came to the conclusion that the white did not in any case pair with the blue (see also Ibis, 1923, p. 270) but one blue one with a white patch on the wing was mated to a wholly blue bird. The colony had fresh eggs, mostly four. The nests are smaller than those of *Ardea cinerea*. On Dara Island a small colony was discovered and some had hatched on May 26.

Squacco Heron. Ardeola ralloides ralloides (Scopo).

The Squacco Heron certainly breeds in the Iraq marshes. Young birds were sent from Abid north of Qurnah on July 19. In the Medina marches, at Beni Mansur, it was found to be nesting freely among the colonies of Night Herons, Darters, etc., preferring isolated clumps of reeds. The nests contained 4 to 5 eggs on July 12. A further winter record is furnished from Baghdad on December 15, while it is recorded from Fao on March 2, so probably some over winter.

Night Heron. Nycticorax nycticorax nycticorax (L).

Vast numbers breed in the Medina marches at Beni Mansur. The nests were placed on broken down reeds two feet above the water inside or on the edge of a cluster of reeds. The nests, compact affairs of reed, had quantities of droppings scattered all over them giving the appearance of being used year after year. On July 12, most nests held 4 eggs. The birds were nesting in company with Squacco Herons and Cormorants. Common at Mosul in winter.

Little Bittern. Ixobrychus minutus minutus (L).

A nest with four eggs on June 30, at Gurmat Ali. Common at Mosul in autumn.

Common Bittern. Botaurus stellaris stellaris (L).

There is considerable suspicion that the Common Bittern is at all events partly resident as Cox and Cheesman heard it ' booming ' in the Hindeyeh marshes on May 29 and 30. I cannot distinguish any eastern race (*orientalis* Buturlin) of this bird.

White Stork. Ciconia ciconia ciconia (L).

At Beled Cheesman found Storks nesting on telegraph wires ; the sticks were laid on the wires close to the pole and nearly every pole had its nest. The telegraph service did not seem to suffer in any way. Breeds at Mosul.

Spoonbill. Platalea leucorodia major Tem and Schl. ' Mifrid '.

Eggs were brought in from the Qurnah marshes on June 21, mostly incubated. A flock seen on Dara Island, May 26. A nest with 3 eggs taken on the Khor Milah, Bubyan Island June 1, 1922. Spoonbills were breeding on Warba Island, May 19, 1907. A colony of 8 or 12 nests was located up the Khor Khanhaki (Khor Musa) May 24, 1907, and another colony up the Khor Bunder amongst the Reef Herons.

Red-cheeked Ibis. Comatibis emerita (L).

Seen near Kirkuk January 21, 1923 (Robb).

White Ibis. Threskiornis æthiopicus (Lath.).

The Sacred Ibis was found breeding in the Rotha marshes near Qurnah ; on July 23, most had young on the wing but four nests with 3 to 4 eggs were found. They did not appear to breed in separate colonies but were mingled with the Cormorants, Darters, etc. About 20 pairs were seen altogether. It also breeds at Abid in the same area. Noted at Baiji in April. (Stanford).

Common Crane. Megalornis grus (L).

Great numbers arrived in the Mosul district when the rains broke at the end of November and in early December going N. W. to S.W. at 4,000 feet altitude (M).

Demoiselle Crane. Anthropoides virgo (L).

At the same time as the Common Crane flocks of these birds were passing over Mosul (M).

Great Bustard. Otis tarda (L).

Arrives Mosul district in September. Common Kirkuk district, December, from an aeroplane 180 counted in one day January 21, 1923, between Altus Kufri and Kirkuk (Robb).

Houbara. Chlamydotis undulata macqueeni (Gray).

One brought into Baghdad on April 18, contained a soft-shelled egg. Mr. Philby found a nest with 3 eggs on March 31, between Zobeir and Hafar-el-Batin on the Arabian side. The crops of three birds shot in November contained 1. Black ants, 2. Black, and white ants, 3. Large Beetles.

Little Bustard. Otis tetrax.

A female shot by Capt. Stanford at Mosul January, 1921.

Stone Curlew. Burhinius œdicnemus.

Unfortunately the collection does not supply any material to determine the breeding race of Stone Curlew. Cheesman says a pair were evidently breeding on the Chaldari sand bank at Baghdad on June 26. A flock of 50 were seen at Anerun in the foothills on October 4, and one obtained is *astutus*, as is one from Daura near Baghdad on March 6. One from Baghdad on September 12 is, from the more rufescent colour of the upper parts, indistinguishable from *saharæ*.

Cream-coloured Courser. Cursorius cursor cursor (= *gallicus*).

'Abd-ul-Gutta' (= slave of the Sand-grouse).

A pair at Feluja on April 25 were obviously about to breed. Breeds at Tekrit and seen June 2 at Mosul.

Common Pratincole. Glareola pratincola pratincoia (L) 'Sevwad'.

Colonies were found at Hindayeh Barrage on May 30 and many nests were found by following a man's footprints in the then dried mud. Another colony exists at Iskandariyeh and several nests still contained eggs on June 23.

Black-winged Pratincola. Glareola nordmanni, Fischer.

A wounded bird was picked up near Baghdad on November 2.

Woodcock. Scolopax rusticola L.

One at Baghdad on December 6, 1921. One Khanikin in March, one near Kirkuk, January 6. Quite common at Mosul, Dohuk, Zakho in winter, one Khanikin, December (M).

Common Snipe Gallinago gallinago (L) 'Wis-was' 'Ferar', 'Huwaidi'.

Terek Sandpiper. Terekia cinerea (Guild).

A small flock on Bubyan Island on April 9.

Little Stint. Erolia minuta minuta (Leisler).

Returned to Baghdad by July 23.

Curlew Sandpiper. Erolia ferruginea (Brun).

One at Fao April 23 and one on Boonah Island on June 10, both in breeding dress.

Ruff. Machetes pugnax (L)

Noted at Baghdad by August 26, an adult female on September 12 is in almost full winter dress.

Redshank. Totanus totanus.

Totanus totanus eurhinus. Oberholser (Proc. U. S. Nat. Mus., xxii, p. 207, 1900–Ladak).

One at Baghdad on August 26 and three from Fao on March 20 belong to the eastern race. Meinertzhagen obtained both forms at Dohuk in December (M).

Spotted Redshank. Totanus stagnatilis, Bechst.

One obtained at Baghdad on January 27. Fairly common in winter especially at Baghdad (M.)

Wood Sandpiper Tringa glareola L.

Noted at Baghdad on December 1 ; few winter records.

Bar-tailed Godwit. Limosa lapponica lapponica (L).

A flock breeding dress on Bubyan Island on April 27.

Curlew. Numenius arquata.

Numenius arquata lineatus, Cuv. (Reg. Amm. nouv, ed. i, p.521. 1829 India). One obtained at Fao on April 15 belongs to this race.

Black-winged Stilt. Himantopus himantopus himantopus (L) ' Kursu '.

Nesting plentifully at Hindia Barrage on May 29. When the nests are on the dried mud or ' bunds ' only a few bits of grass are utilized but where the ground is swampy a good foundation of grass and sticks is made ; one nest was found in a green tuft of grass. On disturbing the colony the birds fly round screaming, then swooping down to the ground they stand flapping their wings to attract attention ; also found breeding at Beled.

Kentish Plover. Charadrius alexandrinus alexandrinus. L. ' D'haarig '.

A nest with two eggs at Iskandaryeh on June 23 ; at Fao it breeds as early as April 2 when a nest with 3 eggs was found.

Sociable Lapwing. Chettusia gregaria (Pall.).

Recorded from Feluja, Aqquar Quf and Sheik Said; earliest September 25

White-tailed Lapwing. Chettusia leucura (Licht) ' Tagallaga '.

Nesting in numbers by the Iskandariyeh canal on May 29 in flooded rice and grass. The birds raise up the height of the nest by bringing mud in their bills and building up quite a shallow cup-shaped mound of mud to which a few sticks are added. The juvenile has the upper parts black with broad rufous brown edges, underparts creamy white.

Red-wattled Lapwing. Sarcogrammus indicus aigneri, Laubm.

Noted at Barzia and Saifee in the hills east of Ali Gharbi (1,000 ft.) early in October. At Aqqar Quf Cheesman found a nest built up with small clods of mud brought by the bird ; it contained 4 eggs on June 11, the bird crept away and made no demonstration—an unusual trait.

Common Lapwing. Vanellus vanellus (L).

Flocks crossing the Jebel Abiad going south on December 13. (Dohuk area).

Crab Plover. Dromas ardeola, Paykull.

On Dara Island the north end and part of the east bank is riddled with the holes of the Crab Plover. The nest tunnel is burrowed obliquely into the sand to a depth of 1½ feet and a length of usually 3 to 4 feet, a slight enlargement at the end of the tunnel serving as a nest-chamber. No nest is made and a single egg only is laid. The tunnel is excavated by the birds themselves, using their feet and probably also their bills, the loose sand being scratched out behind the working bird at a good rate just as if a minature shovel were at work. In one tunnel examined there were four bends and the excavation went

Crab Plover—(*contd.*)

in 8 to 9 feet. The birds fly out of their holes at the least sign of danger, one bird usually being on guard outside, but they soon return to the vicinity of the nest hole uttering their shrill notes *Tchuck-tchuck chuck-chuck-chuck* while at night a continuous *Tchuck-tchuck* is kept up. Eggs were plentiful on May 26 and young in down were obtained by June 7; the latter are helpless and cannot run or even walk. They are fed on the flesh of crabs which are broken up by the parents before being brought to the nest hole. In 1921 it was estimated that there were over 300 pairs and in 1922 about 500 pairs breeding on Dara. On February 26 not a bird as yet had come to the island.

The Crab Plover also breeds in great quantities on Boonah Island in the higher sand banks. In the hard dry soil the holes only went in 4 feet but others had been increased up to 10 feet in length, presumably further excavations of old holes. Here the Arabs had recently collected 600–700 eggs. It also nests freely on Warba Island. All eggs received are absolutely pure white without any signs of spots (Stuart Baker).

Herring Gull. Larus argentatus vegæ. Palmen (Vega-Exp. Vetensk. Arb., v, p. 370, 1887—Arctic coast, Siberia.)

Two adults obtained at Baghdad on November 28 and December 29. Correspond best with *vegæ*; they are certainly too dark on the mantle for *cachinnans*; one had the legs and feet greenish and the other yellow, eyelids of both were coral-red. They are as dark or even darker than a series of *vegæ* from China whence however come birds also as pale as birds from the Mediterranean. Like *vegæ* too these Iraq birds have coarse streaks on the back of the neck and head which in *cachinnans* are usually finer, indeed in winter birds from Sind the streaking is almost absent. Two Iraq skins from the old Euphrates expedition are also referrable to *vegæ*.

Richardson's Skua. Stercorarius parasiticus (L.) (Syst. Nat. Ed. x, p. 136, 1758—Scandinavian coast.)

W. D. Cumming informed me that he saw one once near the Khor Musa—probably early in spring.

Slender-bill Gull. Larus genei Breme (= *gelastes*).

Local movements up the Tigris to the breeding grounds were noted between April 17 and 24. Found breeding at Iskandariyeh on June 15 when a nest with 3 eggs taken. On Boonah Island a few were seen on May 28, 1921, but nests with one to three eggs were found on May 21, 1921. On May 30, 1922, great numbers were nesting there, some were already hatched but many nests had been flooded out by a big tide. On the Pelican islet nests were built on the carcases of Pelicans. On Warba Island this gull was found breeding with Caspian Terns on May 30, 1906, a few had then incubated eggs, most had hatched. Breeding freely there with Gull-billed Terns on the N.E. side on May 19, 1921, laying had just begun and 31 nests of the two species were counted in an area of 5 yards square. On April 5, 1921 the birds had just arrived for breeding purposes. The nests are made of the twigs of a salt bush (Sueda ?). Further colonies were located on the Bu Saif coast near the Khor Musa and fresh eggs were found on June 12—probably the first nests had been flooded out. The Arab name for this gull is 'Simachi Harmi', i.e., forbidden by the Quran to be 'halaled'.

Whiskered Tern. Chlidonias (Hydrochelidon) leucopareia leucopareia (Temm.). 'Smaach'.

Eggs and parent birds were sent from the Ruwayieh marshes on July 14, the eggs being mostly incubated. A few still had eggs on July 27 when La Personne visited these marshes near the Iskandariyeh canal.

White-winged Black Tern. Chlidonias (Hydrochelidon) leucoptera. (Temm.).

Found breeding in large colonies with Common Terns in shallow inundation on the Ruwayeh marshes near Iskandariyeh Canal on July 27. The nests composed of weed and mud were 6 inches across. At this date most have finished breeding but two nests with one and two eggs were found. Attracted by beetles and locusts disturbed by harvesters cutting corn, a flock of 30 were seen at Diala beating up and down over the fields.

Pelican's Eggs at Khor Milab
(2 sometimes 3 in a clutch)

Nest and Eggs of Slender-Billed Gull
(*Laurus genei*)

Flamingos Nests on the Khor Milab
Bubyan Islands.

Photos by V. S. LaPersonne.

LESSER CRESTED TERNS
(*Sterna bengalensis bengalensis*)

COLONY AND EGGS OF LESSER CRESTED TERN

(*Sterna bengalensis bengalensis*)

Photo by V. S. LaPersonne.

Little Tern. Sterna albifrons albifrons Pall (= *minuta.*).

Breeds freely on Abadan, Dara and Boonah Islands. A few still with eggs on June 27. Fresh eggs found on May 20, two sometimes three. All specimens obtained at the head of the Gulf belong to this, the typical form.

Large Crested Tern. Sterna bergii velox Cretzschm.

On Boonah Island four pairs were found nesting amongst a colony of *bengalensis* and they had fresh single eggs on June 10, 1922.

In colouration these eggs run through the usual known variations, the ground colour being white to cream, with markings of deep blackish-brown. These markings consist, in some cases, of big scattered blotches, in others of numerous small spots, and in others again of long twisted lines, such as have given rise to the idea among Mahomedans on the Red Sea, that this bird tries to write verses from the Koran on its eggs. In a few cases the markings are deep chestnut, and in still fewer a pale reddish-brown. In none of the eggs taken in this collection is the ground colour of a beautiful deep salmon tint such as is frequently found in eggs laid both on Astola Island, further south in the Gulf, and also on many islands in the Red Sea. The eggs in this series vary in length from 56·5 by 43·0 to 68·0 by 47·5. This latter egg is also the broadest in the series, the most narrow being 62 by 40 mm. (Stuart Baker).

Lesser Crested Tern. Sterna bengalensis bengalensis (Less).

This Tern was found nesting on shingle and sand at the south end of Boonah Island in colonies of 30–40 pairs. No nest is made and only one egg, according to La Personne, is laid. The nests are very close packed and 37 were found in a space of 3 yards square on May 20, 1922. On May 28, 1921, a hundred pairs were located on the east side nesting on a sand spit just above highwater mark. In June 1922 the colonies at the south end were flooded out and on June 10 were just beginning to lay again. Other colonies exist on Bubyan Island (up the Khor Milah) and on Warba Island (N.E. coast) where on May 26, 1922, a few had hatched. Of these eggs the collectors took both single and two eggs in the clutch, but in no case three, and probably clutches of this number are very exceptional. In colouration they run through much the same variation as does *Sterna bergii velox*, but on the whole they are less handsome and the ground colour is less often cream or salmon. In measurements, the series run from 50·0 × 35·8 to 54·5 × 38·5 mm. In both instances the extremes of length and breadth are found in the same egg. (Stuart Baker).

White cheeked Tern. Sterna repressa, Hartert (=*albigena* auct).

(Nov. Zool., 1916, p. 288—Persian Gulf).

On Dara Island this Tern nests all along the N. E. and N. beaches a few feet above high water mark. Slight mounds of sand four inches high are scratched up on which a few twigs are placed ; on May 26, 1921, the nests held single eggs. Also found breeding sparingly on the N.E. beaches on Boonah Island in 1921 and 1922. In 1906 and 1907 it bred on Warba Is., fresh eggs being found on May 19, but it is unrecorded thence in 1921 and 1922.

A considerable series of these eggs were taken on Dara Island on May 26, 1921, and on Boonah Island on 28th of the same month. A clutch generally consists of a single egg, but there are a fair number of pairs also in the collection. The following eggs seem worthy of particular notice :—

(1) A pure white ground with a few faint grey blotches. The shell of this egg is stout and normal and does not appear to have been laid by a bird in a more or less exhausted state. (2) Ground colour, a very deep cream red, the whole surface richly blotched and spotted red-brown and with small secondary blotches of purple neutral tint. (3) Ground colour, a pale cream with a few pale reddish and lavender smears and blotches. (4) Ground colour, a light buff with dark red-brown primary blotches and spots, and with exceptionally large and dark lavender secondary marks. The extremes of size in the series, are minima 37·1 × 28·3 ; maxima 45·3 by 28·3 and 43·4 × 32·4 mm.

(Stuart Baker).

Caspian Tern. Sterna caspia caspia, Pall.

A single pair nested on the sandy beach at the north end of Dara Island where its two eggs were found on May 26. On Boonah Island three pairs

Caspian Tern—(*contd.*)

nested amongst the colony of *bengalensis* at the south end in May 1921 and 1922. Two nests with one and two eggs May 20. A few pairs bred on Warba Island in 1906, where on May 30, most had hatched. None there in 1907, 1921 or 1922. Breeding there April 3, 1878 (Hume's Nests and Eggs.)

Lesser Sooty Tern. Sterna anæthetus.

Sterna anæthetus fuligula, Licht. (Forster's Desc, Anim, p. 276, 1844—Red Sea). Breeds freely on Dara Island ; the nest is a mere depression in the sand under cover of a salt bush, and at times almost a tunnel leads to the nest. On May 26, 1921 it was estimated that there were about 100 pairs and the next year on June 5, about 350 pairs ; only a single egg is laid and while the female incubates the male sits on the top of a neighbouring bush. None on Boonah Island in 1921 but on May 20, 1922 it was breeding numerously there.

Gull-billed Tern. Sterna (Geochelidon) nilotica Gm (=*anglica*).

On May 21, 1921, the Gull-billed Tern was found nesting on open flat ground or slightly raised ridges along the border of a creek north of the Khor Milah, N.W., coast of Bubyan Island. Another colony was nesting amongst the Pelican skeletons and on April 18, 1922, some had hatched. On Warba Island it was breeding with Slender-billed Gulls on the edge of shingle and scrub, and on May 19, 1921 the nests held 2 to 3 mostly 2, fresh eggs ; a slight nest of twigs is made. It was known to breed in Warba in 1878. There is also a colony up the Khor Bunder. It must also breed inland as already suspected as Cheesman obtained a bird in breeding condition on the Iskandariyeh Canal on June 23.

Great Crested Grebe. Podiceps cristatus cristatus, L. 'Zilif'. (= 'curls') all grebes=' Biraji '.

Two eggs were sent in from the Iskandariyeh marshes on July 14 which evidently were of this species ; they measured 2·15 by 1·4. It must be resident.

Black-necked Grebe. Podiceps nigricollis nigricollis, C.L. Brehm.

With the last, eggs of this species were also sent.

Little Grebe. 1. Podiceps ruficollis iraquensis Ticehurst (Bull., B.O.C., xliv, p. 28—Iraq).

When I wrote the *Birds of Mesopotamia* I had seen but few local specimens of this Grebe and I recorded them as *capensis* but examination of further material and the acquisition of breeding birds has convinced me that the breeding Iraq bird is a separable race. They are smaller than *ruficollis* and *capensis* and the red neck is deeper than in the latter. The white on the wing feathers is more extensive than in *ruficollis* but less than in *capensis*, i.e. it extends well on to the primaries but not to the outer four.

6 ♂ *capensis* Abyssinia and East Africa ...	W. 102–107·5
6 ♀ *capensis* ,, ,, ,, ,, ...	W. 97–100
series *ruficollis* Europe	W. 95–104
2 ♀ Iraq breeding	W. 89–91
9 ♂ ♀ (winter)	W. 83–91·5 one 94 mm.

One from Palestine (Waters of Merom), two 'Asia Minor', one Fayoum Egypt all in breeding dress are apparently *r. ruficollis*; one from Enzeli on the Caspian is *capensis* as are birds from Kashgar and India. *Iraquensis* appears to be a local resident race. I have not been able to re-examine Pitman's two specimens from the War collection but Buxton's from Amara is *iraquensis* so it is doubtful whether *capensis* occurs at all.

2. *Podiceps ruficollis ruficollis* (Pall) (Vroeg's Cat. Adum., p. 6, 1764—Holland). One in the British Museum from the Euphrates expedition I cannot distinguish from the typical race ; it is in winter dress and probably a migrant ; it has no white on the primaries and a wing of 97 mm.

Spotted Crake. Porzana porzana (L).

Cheesman met with at least 20 of these birds at Gurmet Ali on April 19, evidently a recent arrival. The earliest date on passage is March 11 while one was taken on a boat at the head of the Gulf on May 24.

Little Crake. Porzana parva (Scops).

Obtained as early as August 20, near Baghdad. Two young ones obtained in autumn and another from Babylon have the chin and throat pure white and are much whiter below, with no buff in the plumage, than any other young birds in the British Museum though one from Italy and one from Sudan approach them in this respect ; it is probably an individual variation.

Woodpigeon. Columba palumbus palumbus, L. ' Tabaan.'

The Woodpigeon nests at Baghdad in gardens of date palms ; the nest is close to the trunk of the palm and on the top fronds and consists of sticks and fibres but is more flimsy than English ones. Two young of different ages were found on August 2 ; the parent bird apparently starts incubating when the first egg is laid as no doubt other species do in Iraq to keep the egg *cool*. Eggs were laid in one nest when the shade temperature was 122 F.

Some were seen in October near Chasmet Sherin in the hills east of Ali Gharbi and some must breed at Fao still, at least in some years, as one was obtained there on June 30, 1921. Seeds of water melons are a favourite food. Iraq birds seem small, I have measured none over 240 mm. in wing, smallest 221 mm., however nearly all the birds (nine) at my disposal are either moulting or have very worn wings, including two which measured 240 mm. and therefore I hesitate to separate an Iraq race—Woodpigeons vary much in size and a large series of British ones vary from 239 to 262, not a few being not longer in the wing than 245 mm. Woodpigeons were common at Dohuk in December (M).

Rock Dove. Columba livia gaddi, Zar and Loud.

Extends to Dohuk (M). According to Meinertzhagen *palestinæ* must stand as a good race as all S. W. Arabian birds have rumps similar in coloration to the mantle, like the type which came unfortunately from the Jordan Valley on the fringe of its range ; some Palestine birds as I have already pointed out are not separable from *gaddi*.

Turtle Dove. Streptopelia turtur arenicolor (Hart) ' Kumree.'

Thirty nests were found in an area of 10 acres of poplar near Baghdad on June 12. The name ' Tabaan ' given (xxviii, p. 380) for this bird belongs properly to the Wood Pigeon.

Indian Ring Dove. Streptopelia decaocto (Friv).

Noted at Kirkuk in winter. Meinertzhagen records this dove from Mosul (November and December), Khanikin (December), Ramadi (November), but not at Dohuk (M).

Little Brown Dove. Streptopelia senegalensis cambayensis (Gm.)

Cheesman has seen this dove in winter at Beled on one occasion.

Spotted Sandgrouse. Pterocles senegallus (L) ' Kudree '.

Sand grouse generally=' Gutta '.

Cheesman found a nest at Aqqar Quf on June 11, the female was almost invisible on the eggs at 20 feet distance except for its eye ; on being disturbed it flew off and fluttered on the ground. The two incubated eggs measure 43 by 28 and 41 by 27. Cheesman remarks that the difference in colour between the eggs of this species and those of the Pin-tailed reminds him of the difference between typical Mistle Thrush's and Moorhen's eggs. *Senegallus* is a late breeder in Iraq and is only laying when the Pin-tailed have broods out, yet in Sind I have known it to breed in February. Another clutch of 3 from Aqqar Quf on June 23, measure 40 by 29, 44 by 29 and 38 by 27. A nest with one egg on July 30, and another with 3 slightly incubated eggs on August 14. Chicks are recorded from W of Kazimaim on August 18, and from near Feluja on September 20. The chicks when discovered feign death ; they peck food themselves at an early date and have a note like that of their parents. This Sandgrouse was common in the hills E. of Ali Gharbi in October.

Pin-tailed Sandgrouse. Pterocles alchata caudacutus (Gm.) ' Iraqi '.

A nest was found under the lee of a dwarf acacia on June 7, the male was incubating and ran off at 20 yards distance. Eggs were still plentiful by July 29,

Pin-tailed Sandgrouse—(*contd.*)

though they may be found very much earlier. The underparts of adults show a mud stain in the breeding season acquired when watering as I have already noted in the Coronetted Sand grouse (Ibis, 1923, p. 471). Small seeds and clover leaves seem to be the chief food. Cheesman found this Sand grouse common in October in the hills (1,200 ft.) east of Ali Gharbi. The chick has the bare skin round the eye blue grey, iris brown, toes yellowish. Meinertzhagen records that in the dry season there are thousands at Kirkuk which leave with the rains in November. In the Hilla area he estimated 16,000 in the air at once (M).

See-see. Ammoperdix griseogularis (Brandt) (Bull., Class. Physico. Math. Acad. Imp. St. Petersburg i, p. 365, 1843—Persia).

A re-examination of all the Iraq material with further and better specimens leads me to the conclusion that Zarudny's race *ter-meuleni* is not a good one. See-see vary very much individually, and make of skin and time of year make differences. But if a freshly moulted series is examined one can find specimens from Jebel Hamrin which look quite different, one greyer and one more vinous and sandy and I have seen such specimens obtained in the same area in the same week, moreover similar diverse specimens occur in other areas—Kalat, Sind, etc. Four topo-types of *ter-meuleni* examined and a series from Pushti-Kuh and Dohuk examined. Cheesman noted 50 in a flock at a watering in the Jebel Hamrin.

Chukar. Alectoris graeca.

1. *Alectoris græca weræ* (Zar. and Lard.).

Cheesman found this Chukar not uncommon all along the foothills east of Ali Gharbi (S. Luristan) in places such as the Chekkan valley (500–1,000 ft.) and Barz-i-Gez (2,500 ft.). These are topo-typical *weræ* and one from Chasmeh Sherin is the same race. One brought home alive is a much darker bird but in captivity sometimes it was presented by the Wali of Pusht-i-Kuh, exact locality known.

2. *Alectoris græca kurdestanicus.* Meinertzhagen (Bull., B.O.C., xliii, p. 158, 1923—Dohuk).

This race described as darker than *sinaica* and *weræ*, crown browner than in the latter race, no grey on the nape ; nearest *falki* but paler ; no vinous wash on breast as in *cypriotes* and *falki*, W. 164–173. 160–164. This Chukkar is common at Dohuk and round Zakho (M).

Black Partridge. Francolinus francolinus francolinus (L) (Syst. Nat. Ed. xii, p. 275, 1766—Cyprus).

Meinertzhagen considers Mosul and S. Kurdistan birds to be of the typical race (M). I have seen none from this area. It is rather larger and darker than the next.

Francolinus francolinus arabistanicus (Zar. and Harms.).

Nests are recorded with 4 eggs at Baghdad April 11 and with 12 eggs at Kazimain on April 27. Cheesman noted this species at 500 ft. in the foothills east of Ali Gharbi.

The young in down has the iris brown, the bill horn, brown along the ridge of the culmen. The upper parts are creamy buff, from base of bill down centre of crown a broad chocolate brown line, a short narrow line behind the eyes and a long narrow one over the eyes, three broad parallel lines on dorsum and a broken one over the thighs, all brown cream-white ; wings creamy buff mottled with brown.

Quail. Coturnix coturnix coturnix (L) 'Mira'yi '.

Noted at Mosul as frequent in winter.

Ostrich. Struthio camelus (Bull., B.O.C., xxxiv, p. 83, 1919—Syrian Desert).

Struthio camelus syriacus Rothsch.

For the distribution of the Arabian Ostrich see Ibis, 1922, p. 471, *Journal, Bombay Nat. Hist. Soc.*, 1921, Ibis, 1923, p. 208, which brings our knowledge up

Ostrich—(*contd.*)

to date. Though probably not found within our limits to-day it occurs in the Syrian desert west of the Euphrates between parallels 30 and 34 at the heads of the Wadis running to and 100 miles or so distant from that river. In 1789 it was found but 12 miles west of Hit,

Three eggs brought back measure 148 × 117, 155 × 121, 155 × 116 they are pale creamy white, smooth polished with faint pittings. One egg weighed 929 grammes unblown and addled.

Two birds measure according to Cheesman :—

Tarsus	19·5 in.	18·75 in.
Tail	15·5 in	16 in.
Culmen from gape	4·75 in.	5 in.
Back from ground...	4 ft. 1¼ in.	3 ft. 11 in.

MAHSEER FISHING IN THE DECCAN LAKES

BY

MAJOR W. B. TREVENEN

(*With 2 plates.*)

At one time or another much has been written with regard to the pursuit and capture of the Mighty Mahseer in the rivers within our Indian Empire, and the fascination and skill which this sport provides and requires. Another branch of sport, very little touched upon by sporting writers either in the past or at the present day, is that offered by many of the irrigation lakes and reservoirs such as may be found in many parts of the Deccan.

At first sight there would appear to be but little scope for any great amount of skill to be found in sitting still in a boat and trolling a spoon behind it as compared with the perhaps more artistic method of fishing employed in rivers, but, on closer acquaintance, it will be found that there are far more details to be observed and opportunities for testing his skill awaiting the attention of the fisherman than may be at first imagined.

Again it has been said that lake-fishing provides very little exercise as compared with river-fishing and this is, to a certain extent, quite true, but let the angler get fast into a good sporting fish of anything between 15 to 20 lbs., and he will then get all the exercise and excitement he wants for anything from 15 to 20 minutes. Moreover, the best of the trolling is during the hottest months of the year, i.e., in March, April and May, so that the fact that this method of fishing demands less actual physical exertion is rather a point in its favour ; also, at this time, the rivers are so low that the angler has there very little chance of any success. The gun, too, has now been put away until the next season so that the sportsman, who is also a fisherman, has much to be thankful for if he is within reach of one of the lakes wherein he can reasonably hope to continue his sport through an otherwise ' dud ' portion of the year.

So much for an ' apologia ' for this branch of sport if, indeed, one is necessary which I, for one, will not admit, and we will now proceed to consider the question of the necessary equipment.

First and foremost, so far as trolling is concerned, is the question of a boat. The majority of the Deccan lakes are either under the control of the P.W.D. or else belong to the Tata Hydro-Electric Power Co., and in most of these it is possible to obtain a boat of sorts by previous arrangement. In some cases they are rather on the heavy side and consequently difficult to manipulate if there is any wind to speak of. In such cases it would pay the angler to transport a lighter and more suitable boat if he is in a position to borrow or hire one, and if he intends spending more than a day or so at one lake. A few places are fortunate in having a fairly suitable boat on the spot whilst at one of the best lakes of all, i.e., Lake Fife, at Kharakwasla, which is the Poona water supply, the Royal Connaught Boat Club, Poona, keeps three or four boats from October to May. It is, of course, necessary to join this club, either as a temporary or permanent member in order to make use of them but there is also a rowing boat belonging to the P.W.D., permission to use which could probably be obtained from the Ex. Engineer, Poona Irrigation, but this boat is rather large and heavy and requires two men to pull it except on the calmest of days. In a few lakes where no other boats are available it is possible to make use of a collapsible boat but although one *can* fish from one of these, it can only be regarded as a 'makeshift' which affords neither comfort nor space to move one's limbs, and it is, moreover, very difficult and even dangerous to net a fish of any size from this type of boat. In such a case it is better to play him out and tow him to the shore rather than to attempt to net him in deep water.

Having settled the question of a boat the next thing we have to decide is the type of rod which we are going to use. It is, in my opinion, a mistake to use too short a rod for this kind of fishing, nor should it be too stiff; from 13 to 15 ft. is about the right length, fairly stiff, but at the same time with plenty of 'spring' in it. If a fish, when hooked on a short stiff rod, turns quickly again towards the boat after his initial rush, as, indeed, often happens, it is almost impossible to avoid a slack line for a few moments however quickly one reels up the line, but with the extra length and spring of the longer rod the fisherman has a much better chance of keeping a strain on the line. My favourite weapon for this work is a 15 ft. steel-centred split-cane rod. This is powerful enough for a fish of any size that one is likely to meet and would be rather too heavy for a long day's casting and spinning, but as, in trolling, the rod is in a rest on the side of the boat most of the time and is only in the hands actually when playing a fish, the extra weight is of no disadvantage. My second rod is an ordinary cheap 13 ft. single-jointed 'ringal' made for me originally by Mantons, Calcutta, a good many years ago, for tank-fishing, and this has on the whole answered admirably for trolling and has landed many a fine fish, but at the same time I am certain that if it had been a foot or so longer and had had a trifle more spring several good fish that got off owing to a slack line would have been added to the bag.

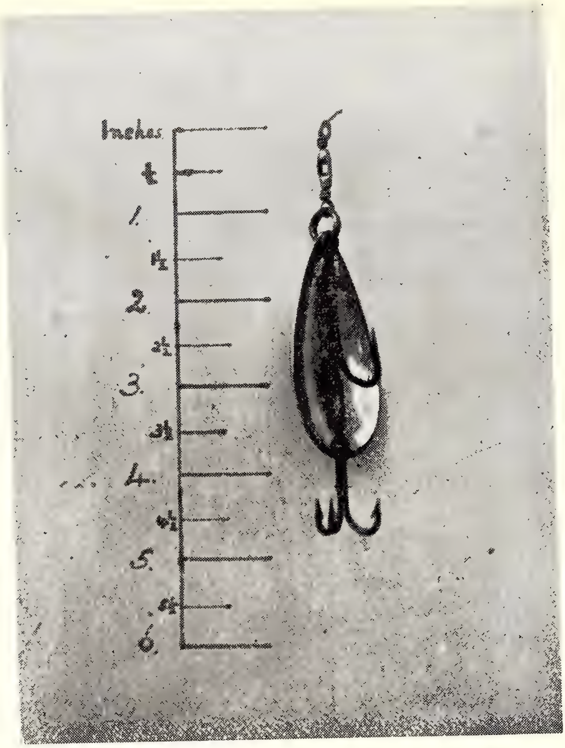
As regards the reel all that is required is a good plain check reel capable of holding about 50 yards of waterproofed silk line (Grilse or Bass size, breaking strain about 25 to 30 lbs.) with from 50 to 75 yards of suitable backing spliced on to it. On only one occasion during eight years regular fishing in the Deccan lakes have I had more than 100 yards of line out. The patent casting reels such as the 'Silex' or 'Malloch' are not necessary for this kind of fishing. The former make is always a luxury and is as suitable for this as for any other type of fishing, but I found that the latter make, though excellent for the purpose for which it is intended, did not answer so well for trolling, the line being apt to come off the barrel of the reel and foul the guard-ring at the first rush if the rod was placed on its side as has to be done if it is placed in a rest in order to admit of the line running free when the fish first takes the bait. When however, the rod was held in the hand in the usual manner this trouble did not occur.

When choosing a line it should be remembered that the *colour* is a very important factor. This is a detail often not recognized and was brought home to me in the following striking manner a few years ago. I had just acquired a new rod and line and was anxious to get a good fish on to test it. Trolling with two rods in the usual manner, one on each side of the boat, on each occasion that I went out, though being fairly successful on the old rod, I could not hook a fish on the new rod with the exception of a wretched little two-pounder. At first, thinking it was due to the pattern of the spoon I changed these over, putting my favourite spoon on the new rod, but the result was still the same; an exchange of traces produced no better result nor did the fact of changing the rods from one side of the boat to the other have any effect. It then occurred to me that it might be due to the colour of the line so I made up a 10 ft. trace instead of the usual 6 ft. length. Even this however, appeared but a slight improvement, the only result being the small fish already mentioned. As a final resource I then exchanged the lines, whereupon the position was immediately reversed, all the fish coming to the new rod even though I had the longer trace on the other rod. This evidence was sufficiently conclusive, and after splicing on another 50 yards of line similar to that which was originally on the old rod on to the unpopular line, I was rewarded by catching fish equally on both rods. This was a most interesting lesson, which I might never have learnt under other circumstances. The line which met with the fishes' approval was an enamelled sea-green plaited silk line with a black thread running down it, whilst the line which was ' taboo ' was a yellowish waterproofed silk line, also with a black thread, and similar to that so often used for trout or salmon fishing at home. Both lines were practically of the same thickness.

Now that we are fitted up with rod, reel and line there only remains the question of leads, traces and spoons or spinning bait, whatever it may be, so far as equipment is concerned. We will take them in this order.

The most satisfactory lead for trolling is, I think, the spiral-grooved spinning lead which can be attached or taken off the line at any point without interfering with the trace. The best place at which to attach it is just above the junction of line and trace as it is then well away from the bait and does not kink the trace as it would if placed further below. The most useful sizes to lay in stock are 3″, 2½″, 2″ and 1½″, weighing about 1¼, ¾, ½ and ¼ ozs. respectively.

As regards traces, except when using a light fly-spoon, I always have them made of wire. The flexible rust-proof gimp or amalgam anti-rust steel wire traces are good but expensive. A much cheaper and equally effective plan is to buy a reel of medium ' Killin ' wire from your tackle-maker and make up your own traces, two yards in length, attaching a ⅝″ or ¾″ swivel in the middle and at one end, with a ' link swivel ' at the other end for attaching to the spoon. It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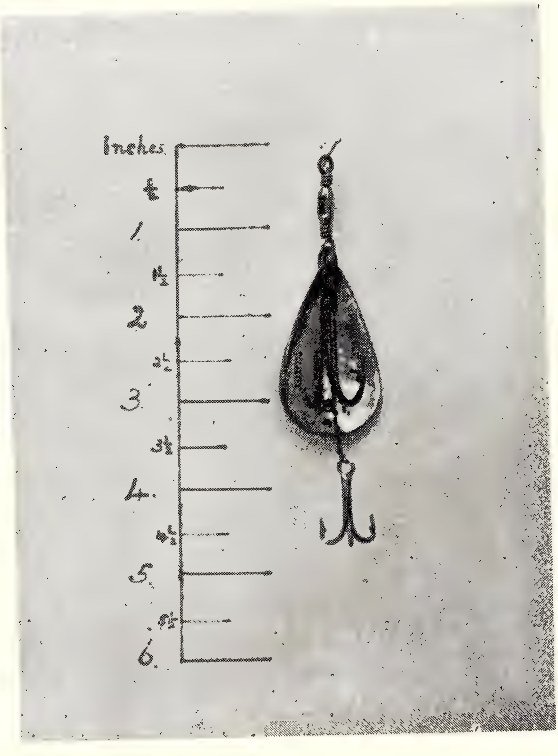
English Pattern Spoon mounted with single hook and triangle.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Hog-Backed Spoon mounted with single hook and triangle may be noted that, when making up these traces, the wire will only twist evenly in one direction. Bend the wire into a loop about four inches from the end, then thread on the swivel and grip the two wires with a small pair of pliers as close to the swivel as is possible, taking care that the two wires lie close together inside the jaws of the pliers. Then, holding the pliers in the right hand, with the left hand wind the loose end closely around the standing part of the wire, twisting it underneath and towards the body, then up over and away from the body, *i.e.* anticlockwise when looking towards the loop end of the trace. The only disadvantage of using this single-strand wire for traces is the possibility of a kink and consequent breakage, and for this reason, I do not care for this wire for river-fishing where one is constantly casting among rocks, etc., but in trolling, with moderate care the danger of a kink is practically nil and I have gone through a whole season frequently without losing a trace from this cause. When using a flyspoon I generally use a ' stout ' trout gut cast with swivels rather smaller than those in the wire trace.

We now come to the most important question of all, *i.e.* the type, pattern, size, colour and mounts of the actual spoon or spinner. Every fisherman has, of course, his own particular fancy in this respect, but after a good many years' experience I have finally come down to two patterns of spoons of varying sizes. For the larger sizes I prefer that commonly known as the English Pattern Spoon made of rather stout copper or brass, preferably, I think, the latter (silver-plated only on the inside) with the outside left the natural colour of the metal but touched up with fine sand paper each time before use. Of this pattern I always keep a supply of 3″ and 2½ spoons. If you buy these spoons from a tackle-maker you will generally find them mounted with large head and tail triangles and a heavy double swivel and lead attached on a short stout piece of gimp. My advice is to scrap all this mounting and use a single swivel only with a flying mount consisting of one large hook with a triangle beneath it. This mount should be made up so that the large hook lies inside of and, of course, at right angles to the hollow of the spoon, and the eye of the triangle should be just inside the end of the spoon when the mount is lying flat. When purchasing the large single hooks one must be careful to see that the sides of the eyes lie in the same horizontal plane as the shank of the hook, otherwise, when the mount is attached, the hook will lie flat inside the spoon instead of at right angles to it. For the 3″ spoon I like a size 6/0 single hook and a No. 1 triangle, whilst for the 2½″ spoon the single hook should be size 4/0 with a No. 4 triangle. The above sizes refer to the scales given by Thomas in *The Rod in India.*

For the smaller sized spoons I prefer the Hog-backed variety, silvered inside, with a mixture of gold paint and varnish on the outside. My two favourite sizes are 2″ and 1¾″, the latter being either mounted with one large single hook (size 4/0) or else with a flying-mount of two small triangles, size 6, whilst the former has a flying-mount of one single hook (size 2/0) and one triangle, size 5. For this pattern of spoon I like the flying-mounts to be little bit longer, in proportion, than in the other type, the eye of the end triangle lying just a little outside the end of the spoon.

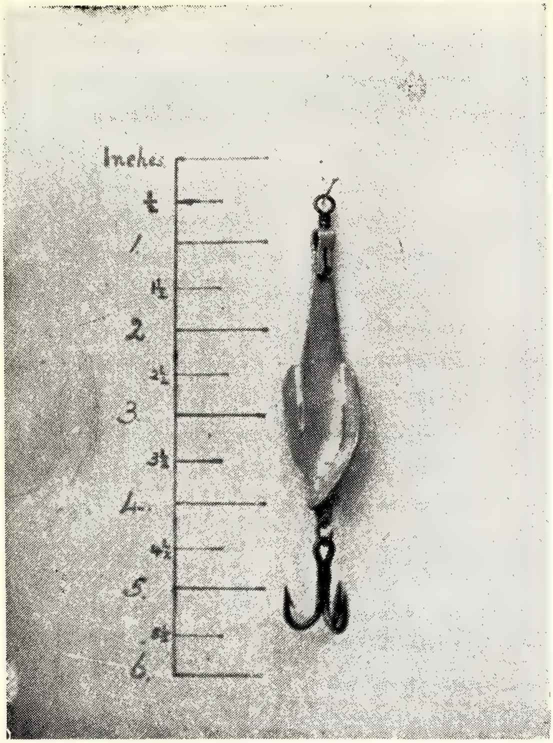
The only other spoons necessary are a few fly spoons of 1″ or even a little smaller, gilt on the outside and silver inside. In some of the lakes these have been found quite successful at times with a light rod and gut trace, but, as a rule, I generally stick to one of the four larger sizes mentioned above.

The only other spinning baits required are one or two 2½″ or 3″ silver minnows. The patterns I found to be the most killing were a 2½″ aluminium 'Reflex' minnow and a 2½″ or 3″ 'Flange' spinner, the latter pattern being mounted with a single triangle only at the tail. As a rule these silver baits are of very little use, but at certain times, as I shall describe later, the fact of having them at hand will probably make a difference of several fish in the day's bag.

The fishing season begins as soon as the water clears after the rains and extends right up to the arrival of the next monsoon when the high winds and rain cause the water in the bigger lakes, which have a large catchment with flat and muddy banks, to get too thick and dirty to be of any use for fishing. In a few of the smaller lakes situated right up amongst the hills where the catchment is small and the shore is steep and clean the water remains fairly clear for sometime even after the rains break and I have heard of quite good catches being made at this time by wading and casting with a fly-spoon from the banks, but as the mahseer are then starting to spawn, it is more sportsmanlike to leave them alone at this period especially as they put up nothing like the fight that they do earlier in the season.

The cream of the fishing is undoubtedly in March, April and May when the water level in most of the tanks has fallen considerably, but there is always a chance of a fish from October onwards, and December, January and February are very often quite good. In trolling it is only necessary to go just fast enough to make the spoon spin, and as a general rule about forty yards of line should be let out. A knowledge of the depth of water and the nature of the bottom is of great assistance as this will avoid the loss of many a spoon if there are many 'snags' about. Also at certain times the fish will be found to lie in shallower places where a bank or spit of land runs out into the lake and here a lighter sinker will be required. There is no hard and fast rule but as a general maxim it is better to fish with a larger spoon and with 1½ to 2 ozs. of lead at the beginning of the season, using a smaller spoon and less lead as the season advances. Again, on a cloudy day or early in the morning the fish lie deeper than they do in the hot weather or during the heat of the day.

Throughout the first month or so after the rains only a few isolated fish will be seen rising, but as the season advances small combined 'rises' lasting for a minute or so suddenly appear now and then when a shoal of mahseer hit upon a collection of small fry. As the season still further advances these 'rises' become more and more frequent and last for a much longer time until, in March, April, and May, one can sometimes see a patch of water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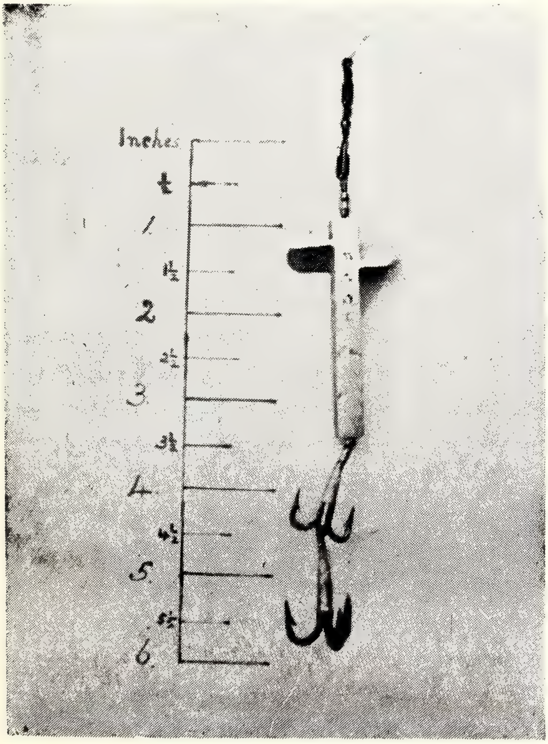
3″ Copper Flange Spinner painted with aluminium paint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2½″ Aluminium Reflex minnow

over a hundred yards long absolutely ' on the boil ' with mahseer chasing the small fry which are leaping and skimming the water in all directions in their efforts to escape.

Whenever these rises appear, if they are within reasonable distance, every effort should be made to get the boat to the spot as quickly as possible and if one can arrive there before it stops the chances are in favour of getting a run. Even if it has stopped for half-a-minute or so one is often lucky enough to happen on a fish who is on the look-out for the last one or two of the fry remaining behind.

It is during these rises that the silver minnow is so successful, particularly towards the end of the season, but it is a curious fact that, with this exception, the fish seem to have very little use for any silver bait, and always prefer a spoon with the copper or brass colour on the outside. Early in the season when the rises are few and short it is best to keep the ordinary spoons on both the big rods and keep a light rod and minnow ready in the boat on the chance of arriving at a ' boil ' before it has ceased, when one can either cast on one side or the other or else troll the minnow a few yards behind in between the other two lines. In April and May, however, when the rises are much more frequent and last longer, I very often keep a minnow on one of the big rods as well and have the third rod ready in addition.

On going through a ' rise ' if there is time I shorten the lines on both big rods up to twenty yards and have the minnow on the light rod only five yards or so behind the boat. When a good ' rise ' is really going on the fish seem to have no fear of the boat and only this last season (1925) my minnow was taken by a 13½ lbs. mahseer when it was within a couple of yards of the stern of the boat. At such times it is a good plan to have someone else in the boat in addition to the boatman who can reel up the other two lines when a fish is hooked as it frequently happens that one gets a run on two rods almost simultaneously, when, if there is no one to look after it, the light rod is apt to go overboard unless one has taken the precaution to make a line fast to the butt end.

As regards the particular spots over which to troll, information, more or less reliable, will probably be available from the local fisherman, or, better still, enquire, if possible, from any brother angler who has fished the place. If the fish are showing themselves one will naturally follow them. As a broad rule I have generally found that fish are apt to lie a little distance off the shore not very far from the bund or lower end of a lake but there probably will be a equally good, if not better, places in most lakes known to the local fishermen or inhabitants. Even if no fish are seen rising one need never despair. I once caught six fish including two of 17½ and 12½ lbs. respectively on a day on which I never once saw a fish break water.

As regards size, generally speaking, anything over 20 lbs. is an exception. In still waters mahseer do not appear to run to the same size as they do in rivers. Whether it is scarcity of food or want of variety in the same, or whether it is the fact that running water produces more muscular and quicker growing fish it is difficult to say but I am inclined to the latter view. A fish caught in a river always appears to have a healthier, brighter, and a more 'clean-run' look about him than one caught in a lake. Lake fish also, differ as a rule, particularly as regards the larger specimens, in being of a shorter and 'stockier' build than river fish. Instead of drawing odious comparisons, however, we must be duly thankful that we have this sport to fall back on at a time when all river-fishing except that in the largest rivers is at an end.

As to climatic conditions at the time of fishing, a calm day or one when there is just a light ripple is certainly the best. Moreover it is then possible to spot any moving fish which it is very difficult to do if there is much wind. A cloudy day or one when there is thunder about is rarely satisfactory, but a strong wind in itself does not appear to put the fish of their feed so long as the water remains clear. I have caught fish on a day when the wind was so strong that it was difficult to make any headway against it in the boat, but it is tiring work for the oarsman and the conditions are not nearly so pleasant or auspicious as on a calm day. On a windy day when the water is rough the only way sometimes to spot a 'rise' is by watching for the appearance of various water birds swooping down and feeding on the small fry trying to escape from the mahseer.

In addition to mahseer most of the Deccan lakes hold Wallago Attu, commonly known as 'The Freshwater Shark', and this fish will frequently be taken when trolling for mahseer, more particularly when fishing deep or at times when the boat is being turned and consequently the bait sinks lower in the water. I imagine, however, that very few anglers will fish especially for them as they give but small sport when hooked, coming in like a log after their first short rush but, nevertheless, for the table they are by no means to be despised, having a much better flavour than their more aristocratic brothers. In some of the Deccan lakes there are other varieties of carp besides the mahseer, the largest and most sporting being *Barbus dobsoni*, a carp not altogether unlike a mahseer, but being considerably deeper-bodied in proportion, and with a very much smaller head and mouth. I have caught this fish up to ten pounds in weight, and I have seen them even larger. They will occasionally take a spoon, particularly the bigger fish, but paste will be found more effective if you can catch them on a day when they are on the feed. These carp, however, have the same characteristics as tench at home, in that one may fish day after day and meet with but little success until suddenly the word for a 'Bara Khana' appears to go round, whereupon for a period of anything from a couple of days to a week really good sport may be had by fishing with a light rod and a trout gut cast and small single hook or else a very small triangle using a paste bait and fishing deep near the outlet of the lake. The Olive Carp (*Barbus chrysopoma*) is also another fish found in most of the lakes, but this variety rarely exceeds a pound in weight and is only to be taken by bottom, fishing, and, when caught, is not worth anything from a culinary point of view. This fish has red fins and in appearance is not unlike the English Roach.

When bottom-fishing two other varieties will often come to hand, i.e., *Rohtee ogilvii* and *Rohtee vigorsii.* The former of these rarely exceeds six inches in length and may be known by the black bars on his back which are very noticeable when he first caught but which fade away very quickly. This fish is a regular pest occasionally, taking the bait off the hook before the other fish can get a chance. *R. vigorsii*, also a bottom feeder, grows to a bigger size but does not often exceed a pound in weight. He may be distinguished by his larger size and by the fact that he has no black bars on his back. On rare occasions I have caught them on a small spoon.

In some of the lakes mahseer can also be taken by fishing with paste, bread, or other bait either on or near the surface or else at the bottom. In one place I have frequently seen anglers using ' bajas ', a sort of confectionery consisting of ground gram, onions, and atta, fried in sweet oil, obtainable in the local bazaar, but I never saw a fish caught with these although I have heard reports of their success.

In conclusion I will now give a few tips which may be of use to any brother angler whom the above remarks may have persuaded to try his luck in this particular branch of fishing.

The best time of the day for bottom-fishing is undoubtedly from sunrise up to about 10 a.m., whilst for trolling, the morning from 9 a.m. up to twelve o'clock or 1 p.m. is perhaps the best, but again it is often quite good for an hour or so before sunset. The afternoon from 1 p.m. to 4 p.m. rarely appears to give much result.

When there has been a considerable amount of wind for a day or so the fish will often be found to be lying in the smooth water in the lee of some hill.

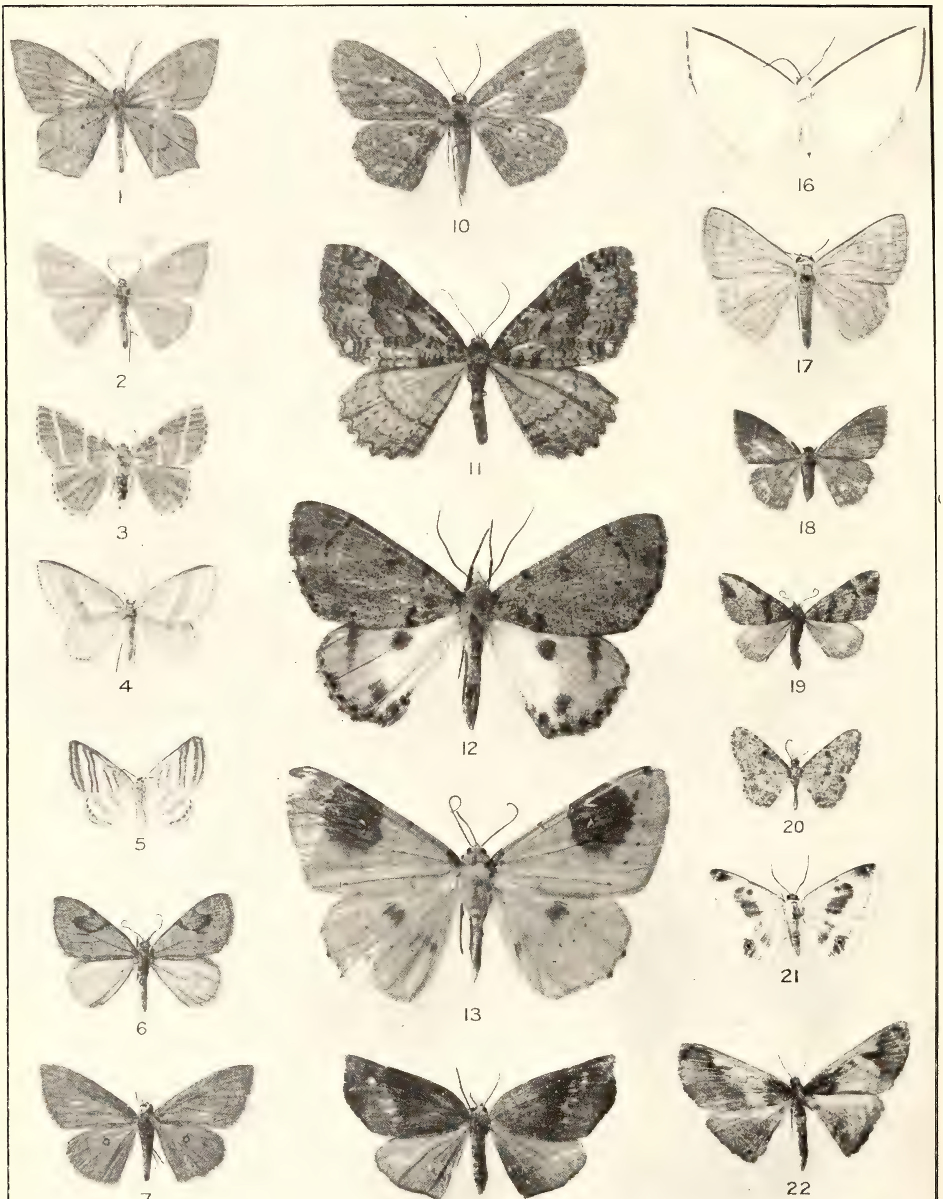
If a fish is hooked when trolling I always make my boatman go on slowly rowing until I have recovered a certain amount of line after the first rush. By so doing the chance of a slack line resulting from the fish turning towards the boat is, to a certain extent, avoided. This plan also gives time for the second line to be reeled up without danger of fouling the other line or the bottom.

A bright spoon is more visible and much more attractive than a dirty spoon, therefore always carry a small piece of fine sandpaper for touching up the outside of the spoons. Failing this, a little fine sand and water will do as a makeshift. A small piece of ' shammy ' leather is useful for cleaning the silver-plate on the inside.

Always find out if your boatman has had previous experience before trusting him with the landing net. Many a good fish has been lost by prematurely making a dash at the fish from the front and getting the hooks caught in the net. Wait, particularly if it is a big fish, until he is practically ' done ', and then tell your man to put the net in the water and bring it up from behind, getting the fish's tail into the net first.

For bottom-fishing with paste for any of the carp family use a fairly fine trout gut cast with a very small eyed hook (size 1, Eyed Kirby Hook Scale) or else a very diminutive triangle. If the paste is rather on the soft side the latter will hold it on best. A friend and myself once caught several fine fish ranging from 2 lbs. up to 9 lbs. on these hooks on a day when we could do nothing with a larger-sized hook and a necessarily bigger bait.

One final word of advice. When you first hook your mahseer do not worry about ' striking ' him—he will do that for himself—but *hold him hard*, particularly at the start, and never let him have an inch of slack line if you can possibly avoid it. Far more mahseer are lost by not keeping sufficient strain on the line than by putting on too much. Give him half a chance and he will very quickly either shake the spoon out of his mouth or else rub it off against a rock or stone at the bottom if you let him get so far.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Geometridæ from Upper Burma.

ON A COLLECTION OF MOTHS OF THE FAMILY *GEOMETRIDÆ* FROM UPPER BURMA MADE BY CAPTAIN A. E. SWANN

BY

LOUIS B. PROUT, F.E.S.

(*With a Plate*)

The following memoir deals with a small section only of a wonderful collection of Heterocera made by Capt. Arthur E. Swann in the Kachin Hills, a few miles from the Yunnan Frontier, almost exclusively through the agency of light. Capt. Swann was stationed for a time (in 1921–23) in an ideal district and one which had not previously been worked by the Lepidopterist and it was at the instigation of our mutual friend the Rev. C. R. N. Burrows that he took up the collecting of the moths. Unfortunately this was not until near the end of the 1922 season, but throughout that of 1923 he worked with great enthusiasm and truly remarkable success, assisted by his equally enthusiastic wife.

The major part of the collection has been presented to the British Museum and, it is to be feared, can only very gradually be made known to Science, there being no staff of specialists available to work it out *en bloc*. The Geometridæ, however, have been very generously presented to me, through the kind offices of Mr. Burrows, to whom, as well as to Capt. Swann, my best thanks are due. As they constitute by far the most important contribution to the Geometrid fauna of British India which has been made since the Lepidoptora of the Khasis were investigated some 30 years ago, I have felt it a duty to Science to work out the collection in detail; the more so because it represents not a selection but a virtually complete record of the visitors to light during the period worked. It is this latter consideration which has induced me to record in all cases the numbers of specimens, together with dates, as also to include the few which, from one cause or another, have not been determinable.

Concerning the head-quarters (Htawgaw Fort) and the other localities in which he collected, Capt. Swann has furnished me with valuable topographical notes, which I cannot do better than reproduce *in extenso*. I have arranged the names alphabetically, for convenience of reference.

Blackrock, 26° 2′ N. lat., 98° 35′ E. long., 4,760 ft. In oak and pine jungle in Ngawchang Valley. Jungle not very dense.

Chui Haw, 25° 57 N., 98° 38′ E., 6,740 ft. A Yawyin village. Topographical details much resemble those given for Kangfang, but it is not in the Ngawchang Valley but in that of the Chui ho Ta, a tributary.

Fenshuiling Pass, 25° 54′ N., 98° 40′ E., 7,500 ft. A waterlogged, very thickly jungled tract, abounding in ferns, orchids and rhododendrons and every tree festooned with dripping moss. A wonderful spot in many ways, but a most unpleasant one to be in during the rains (i. e. now [July]), as it is infested with leeches—both the mud and water varieties underfoot to crawl into your boots and the green ones above you in the trees to drop upon you adroitly as you pass underneath. Moths were taken at 8,000 ft. at Capt. Swann's camp about 4 miles from the pass.

Hkamkawn, 26° 0′ N., 98° 25½′ E., 4,080 ft. A Lashi village in the valley of Ngawchang Hka River. Moderately dense jungle. Frost in winter.

Hparè, 25° 50′ N., 98° 25½ ′E., 5860 ft. In valley of Hkainghing Hka River, amongst terraces of wet paddy land. Hills, densely jungled, rising to 10,000 and 12,000 ft. on either side. A Lashi village. Climate similar to Htawgaw.

Hpimaw Fort on slopes of Irrawaddy (Salween Divide), 6 miles from Yunnan boundary, 26° N., 98° 38′ E., 7850 ft. Precipitous country. Sandy soil. Grass-covered slopes with trees, but not so densely jungled as other lower localities.

Htawgaw Fort, Kachin Hill Tracts, 25° 57′ N., 98° 22½′ E., 6,025 ft. A precipitous spur of soft granite rock covered with pine trees and shrubs such as rhododendrons, wild raspberries, etc. Rainfall 80 inches. Frost and sometimes snow in winter. Extreme hot weather shade temperature 90° F. The collecting was on the terrace of Capt. Swann's house by the aid of a 300 c.p. lamp.

Kangfang, 26° 8′ N., 98° 40½′ E., 5,400 ft. A Yawyin village in valley of Ngawchang Hka, at its junction with the Hpawtê Hka. Mostly grassy slopes, sandy soil and not densely jungled. Similar to Hpimaw.

Langyang, Kachin Hill Tracts, 25° 57½′ N., 98° 18′ E., 4,400 ft. On eastern slopes of Pyepat ridge, in densely jungled, precipitous country. Rainfall about 100 inches. Frost in cold weather. Extreme hot weather shade temperature about 95° F. Langyang is a small Lashi hamlet of about 12 bamboo houses.

Laukhaung, 25° 54′ N., 98° 11′ E., 4,200 ft. A Maru village on western slopes of Pyepat ridge in very densely jungled country—foot hills between Htawgaw and the Nmai Hka, 9 miles above the Nmai Chipwi confluence.

Shingaw Hka, 25° 39′ N., 97° 53′ E., 730 ft. At the junction of the Shingaw River with the Nmai Hka River (the latter is the left upper branch of the Irrawaddy). Very dense jungle and bamboo. Heavy rainfall.

Wausaung, 25° 22½′ N., 97° 36′ E., 550 ft. A Shan village on Namyin Hka River (tributary of Irrawaddy), 11 miles East of Myitkyina Plains. In very dense jungle.

The general affinities of the fauna, as would be expected, are with that of the north-east Himalayas, of which the Kachin Hills are outliers; but there is also a sprinkling of species which were hitherto only known from the mountains of Szechuan.

The district must be extremely rich. The collection of 1,075 specimens of Geometridæ embraces about 329 different species. The further fact that some 175 of these (or appreciably over one-half) are represented by a single specimen only, suggests that there may be still a large number of species which have escaped detection altogether. It may also be remarked that a considerable percentage of those taken in 1922 did not recur in 1923. A rough comparison with the principal faunistic memoirs of 30 to 40 years ago will also help to bring out the richness of the present collection. Of its 329 species, 95[1] forms are new to science—mostly new species, a few merely sub-species. Mr. Warren's descriptions of new species in the Elwes collection (*Proc. Zool. Soc. Lond.*, 1893) it is true, reached a total of 176, but this collection was the work of some years and of several collectors, and embraced all parts of British India. The Atkinson collection, worked out by Moore in 1888, produced about 158 novelties in the family, the result of many years' collecting and not exclusively in one locality. The fine Hocking collections from Dharmsala (*Ill. Het.*, vii, 1889) included about 189 Geometridæ 44 being described as new and a good many others missed through being wrongly identified; but these were the fruits of three years' collecting. The Nilgiri collections worked out by Hampson (*Ill. Het.*, viii, 1891) were the work of three collectors and totalled 207 geometrid species, 64 new. The same author's Ceylon Catalogue (*Ill. Het.*, ix, 1893) contained 225, but only 2 new. How many new Khasi species were described by Warren and Swinhoe in the nineties, I have not been able to reckon; the number must have been very large, but it was spread over some years.

The 329 species comprise 20 *Hemitheinæ*, 36 *Sterrhinæ*, 98 *Larentiinæ* and 175 *Geometridæ*; the *Œnochrominæ* are entirely unrepresented. The absence of these and the number of the *Larentiinæ* are in striking contrast to the various tropical Indo-Malayan collections at which I have recently been working, and support previous ideas as to the general dominance of the last-named in temperate and mountain regions. *Perizoma* alone is represented by fourteen species and *Eupithecia* by twelve. Another striking feature is the prevalence of the small Boarmiid species; there are no less than thirty *Ectropis*, mostly small, and about one-third of them are new to science. *Cleora* makes a good second, with 17 species, 5 or 6 new.

As regards the arrangement of the present work, I have followed my own revisions—complete or incomplete—in the first three sub-families, but have left the mixed geometrine assemblage (*Boarmiinæ*, auctt.) as nearly as possible in the order of Hampson's *Fauna of British India*, Moths, vol. iii, which, with all its faults, remains the only systematic work on the subject. Synonymy is only quoted where there is some special purpose to be served or some vital correction to be made; absence of a citation is neither to be taken as evidence of acceptance nor of rejection. Similarly a name which Hampson had sunk is often resuscitated without comment; his 'lumpings' were so notoriously inaccurate that it is unnecessary to furnish evidence in every case of change. The distribution of the species, too, is generally only given where I have something fresh to add to that which can be found in Hampson or in vol. iv of Seitz's *Macrolepidoptera of the World*. The very many species which appear to be new for Burma are marked with an asterisk.

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[1] This figure includes the two which I published in 1923 (*Ann. Mag. Nat. Hist.* [9], xi.), but does not include some half-dozen or more which are referred to in the present memoir, but not named.

Finally, a word of praise is due to Capt. and Mrs. Swann for the beautiful condition of the collection. The occasional mention of 'worn,' 'rubbed' or 'torn' specimens is no evidence to the contrary, for they were intentionally sending all their captures, where recognizable; and condition only needs comment where it affects the definiteness of a determination.

Subfam. HEMITHEINÆ.

1. *Archæobalbis* sp.

Hpimaw Fort, 9–13 August 1923, 1 ♀.

Badly torn, especially the hindwings, apparently intermediate in shape, and evidently so in the underside, between *ochreipicta*, Swinh. and *usneata*, Feld., possibly a ♀-form of the former, as it has similar posterior spots on the forewing above. The British Museum Collection has as *ochreipicta* ♀ a closely similar example from Kulu, with the borders beneath slightly more *ochreipicta*-like than in Capt. Swann's specimen. The ♀ ♀ in this genus seem more rarely to come to light than the ♂ ♂ and are much less well known at present.

* 2. *Neobalbis elaearia* (Hmpsn.)

Pseudoterpna elaearia Hmpsn. *Journ., Bom. Nat. Hist. Society*, xiv, 654 (1903) (Darjeeling; Khasis).

Htawgaw, August 1923, 1 ♂.

A rare species, hitherto only known to me—with the exception of the original Darjeeling ♂ —from a few Khasi specimens. Hampson has chosen his ♀ (Khasis) for the type, as is shown by the originals in Coll. Brit. Mus., though he has neglected to publish any detail.

3. *Terpna vigil* sp. n. (Pl. 1, fig. 12).

♂ 54 mm. Head and body light brown, tinged above with olive, the body with some admixture of black, especially on side of abdomen; a blackish mark on side of frons; a black spot on tegula (patagium of Hampson). Palpus largely black. Foreleg black, ringed with light brown. Thoracic and abdominal crests strongly developed (section *Dindicodes* Prout). Antennal pectinations extremely short (scarcely 1).

Forewing light brownish olive, sprinkled (at costa more strigulated) with black; a black spot at base; a small oblong costal spot at 5–6 mm.; a dot on M and a thick, rather more distally placed, excurved or horseshoe-shaped mark from SM to abdominal margin indicating the antemedian line; a black cell-spot set in a cloudy orb; postmedian indicated by black vein-dots, slightly connected anteriorly, small posteriorly, curved about R^2; some slight subterminal clouding; terminal dots large; fringe with black dots opposite veins.—*Hindwing* rather less elongate than in *crocina* Butl., etc., broadly whitish abdominally, then orange; a large black cell-spot; an almost equally large subterminal spot behind M^2; two smaller ones at abdominal margin near tornus; a thick, tapering streak from costa to R^2, not quite so near termen as that of *crocina*; terminal dots even larger than on forewing, accompanied by some irregular irroration; fringe-dots deep black.

Forewing beneath predominantly orange, with coarse irroration; a very large cell-spot; a large subterminal spot from SC^4 to beyond R^2, almost confluent on R^3 with a smaller and weaker inter-radial one distally; a second subterminal spot between the medians ; termen and fringe spotted. Hindwing much as above, the pale part scarcely so white.

Hpimaw Fort, June 1923, the type only.

A very fine species, in some measure connecting the subgenera *Dindicodes* and *Absala*.

* 4. *Terpna mölleri* (Warr.)

Dindica mölleri Warr., Proc. Zool. Soc. Lond., p. 349 (1893) (Sikkim).

Hpimaw Fort, 9–13 August, 1923, 1 ♀.

Previously known from Sikkim and the Khasis.

5. *Metallolophia arenaria* (Leech).

Pachyodes arenaria Leech, Tr. Ent. Soc. Lond., p. 144, pl. 9, fig. 12 (1889) (Kiukiang).

Hypochroma danielaria, Oberth., *Et. Lép.*, vii, 291, pl. 173, fig. 1697 (1913) (syn. nov.) (Siao-lou).

Htawgaw, early July 1923, 1 ♀ (large).

Another rarity, though apparently with an extended range in China and Upper Burma.

* 6. *Lophomachia albiradiata* (Warr.)

Uliocnemis albiradiata Warr., Proc. Zool. Soc. Lond., p. 356 (1893) (Naga Hills).

Htawgaw, June, 1 ♂.

An extremely interesting capture, Warren's type ♂ (not '♀', as published) having hitherto remained unique. In Wytsman's 'Genera Insectorum' (*Hemith.*, p. 167) I doubtfully referred it to *Mixolophia*, but the well-developed frenulum brings it into my fourth group and by my Key it will fall into *Lophomachia*—a fairly satisfactory position.

7. *Lophomachia semialba* (Walk.)

Thalera semialba Walk., List Lep. Ins. xxii, 601 (1861) (Sarawak).

Htawgaw, early July 1923, 2 ♂ ♂.

Both specimens are large and heavily marked. The species extends westward to the Khasis and southward to Sumatra and Borneo and there is a small, greener race in Ceylon (*viridior* Prout, 1916).

* 8. *Comibæna swanni* sp. n. (Pl. 1, fig. 3)

♂, 24–25 mm. Head green, slightly mixed with white ; fillet concolorous. Palpus moderate, white, the 2nd and 3rd joints brown on outer side (lost in type). Antennal shaft rather short and broad, the pectinations not very long, the longer (outer) about 4. Thorax green ; abdomen mostly whitish, anteriorly greener, posteriorly pure white. Legs white ; foretibial tuft black-brown ; mid and hind femur and tibia with black-brown spots at middle and end ; hindtibial process nearly reaching end of first tarsal joint. Frenulum very slender.

Forewing bright green, slightly more yellowish than in the genotype and slightly irrorated with white ; costal edge white ; veins extremely finely whitened ; lines white, firm, rather broad ; antemedian well beyond one-third, slightly bent in front of cell-fold ; postmedian straight, about 2 mm. from termen ; terminal line white, with microscopic brown dots between the veins, at least in anterior part ; fringe whitish green, with large chocolate-brown spots opposite the veins except tornally.—*Hindwing* concolorous ; costal margin white ; lines obsolete ; terminal white line almost clear ; fringe-spots rather weaker than on forewing.

Forewing beneath of a similar green, becoming whiter posteriorly, more broadly so tornally ; a black-brown cell-dot ; a white line shortly beyond, less oblique than termen, weakening posteriorly, ending close to the postmedian, which in posterior part shows through faintly from upperside ; a wavy fuscous terminal line, uniting the dots (here well developed) with the fringe-spots, which are also fuscous ; fringe otherwise white, with indications of a second, more slender, wavy line close to tips. Hindwing green ; cell-dot, termen and fringe as on forewing ; postmedian line rather further from cell-dot, stronger, very gently curved (less so than termen).

Htawgaw, July 1923 (type) and August to September 1923 (paratype).
Near *latilinea* Prout (=*theodoraria* Oberth., *Et. Lép.* xii (2), fig. 3277, syn. nov.) but without red terminal line and with different underside.

* 9. *Comibæna cenocraspis* sp. n.

♂, 25–26 mm. Extremely like *swanni* Prout (*supra*). Palpus apparently a trifle shorter. Hindtibial process rudimentary. Face whiter (tinged with green above). Wings slightly paler green. Forewing with the white lines slenderer, the antemedian not bent in cell, the postmedian a little less straight (suggesting the slightest possible inward curve), termen and fringe unspotted, the latter white. Forewing beneath with no cell-dot, the lines of upperside reproduced, the postmedian therefore much more distal than the single line of *swanni*. Hindwing beneath with no cell-dot, postmedian line nearer to termen than to cell.
Hparê, September 1923, 7 ♂♂.
Strongly reminiscent of *Euchloris chlorophyllaria* Hedem., except in the presence of the frenulum. Unfortunately all the examples are more or less worn, so that the colour distinctions from *swanni* must not be unduly stressed; but the differences in the lines and in the fringe are manifest at once. Moreover its build appears somewhat less robust than that of its ally.

10. *Gelasma thetydaria* (Guen.).

Iodis thetydaria Guen., Spec. Gén. Lép. ix, 358 (1858) (Central India).
Hpimaw Fort, 9–18 August 1923, 3 ♀♀.
Already known from India to West China and from the Philippines.

* 11. *Gelasma fuscifimbria* Prout.

Gelasma fuscifimbria Prout, The Entom., xliv, 28 (1911) (Khasis).
Hpimaw Fort, June 1923, 1 ♂.
Not quite typical, the fringes being less darkened, etc., but provisionally referable here.

* 12. *Gelasma dysgenes* Prout.

Gelasma dysgenes Prout, Nov. Zool., xxiii, 13 (1916) (Tibet).
Kangfang, June 1923, 1 ♂.
This determination is likewise far from certain, the example being opaquer than my original series and in some respects more resembling the preceding. The group will require closer study when sufficient material is available.

13. *Gelasma* sp.

Hpimaw Fort, June 1923, 1 ♂.
Smaller and paler than the two preceding, distinctly greener than *fuscifimbria* but a little rubbed and faded. I have compared it carefully with *glaucaria* Walk. and *albistrigata* Warr. but cannot make it agree with either, though a Wa-shan ♀ placed among *albistrigata* in the British Museum Collection seems the same. I do not venture to describe it at present.

* 14. *Gelasma chromatocrossa* sp. n. (Pl. 1, fig. 1).

♂♀, 31–32 mm. Face bright red. Palpus about 1½, little longer in ♀ than in ♂, terminal joint about ½; red, beneath narrowly whitish. Vertex white; occiput green. Antennal shaft white proximally, tinged with pink distally; pectinations of ♂ proximally long (6 to 8). Thorax and abdomen green above, whitish beneath. Legs slightly tinged with pink, the forefemur and foretibia somewhat darkened above; hindtibia of ♂ with the hair-pencil rather slender, no terminal process.

Forewing with apex minutely produced, termen little curved (slightly more so in the ♀); SC^1 anastomosing with C, R^1 just stalked (♂♂) or just separate (♀), M^1 shortly stalked; green (less bluish than in the *Thalerura* group) with costal edge pink; a deep green cell-dot; lines more olivaceous green; antemedian obsolescent; postmedian denticulate, not distinct, vaguely pale-edged distally; a series of dark terminal dashes, well separated at the veins; fringe pink, with dark spots at vein-ends—*Hindwing* fairly broad, the tail at R^3 moderate ; cell-dot rather strong ; postmedian with the usual teeth at R^3 and M^1 about equal ; termen and fringe as on forewing.

Underside slightly paler, especially on hindwing ; forewing with the pink costal margin proximally broader, costal edge of hindwing also narrowly pink ; markings obsolete, or the cell-dots very feebly indicated ; termen and fringe as above.

Htawgaw, June to July, 1923, 2 ♂ ♂ ; Hpimaw Fort, early July 1923, 1 ♀.

* 15. *Thalassodes aptifimbria* Prout.

Thalassodes aptifimbria Prout, Nov. Zool., xxiii, 207 (1916) (Darjeeling).

Htawgaw, August 1923, 1 ♀.

* 16. *Hemithea distinctaria* (Walk.)

Thalassodes distinctaria Walk., List Lep. Ins., xxxv, 1607 (1866) (N. India).

Hpimaw Fort, June 1923, 1 ♂.

Perhaps represents a separable race, the costal edge of the forewing being somewhat redder, the markings of the abdomen slightly restricted. The name-typical form is common in Sikkim, while the Khasis produce a race which I have named *laeta*, *Ann. Mag. Nat. Hist.* (8) xx, 173, pl. 7, fig. 18.

* 17. *Iodis ctila* sp. n.

♂, 29–31 mm. Face dull green, discolouring towards orange. Palpus 1½, 2nd joint slightly upcurved, with slight terminal tuft above, 3rd joint moderate, porrect ; above as face, beneath white proximally. Vertex white ; occiput pale green. Thorax and abdomen pale green above, dirty white beneath. Hindtibia with the terminal spurs short ; hindtarsus rather over ½.

Forewing with SC^1 just from cell (2 specimens) or about connate (3), closely approaching or anastomosing C, R^1 rather well stalked, M^1 connate or just separate ; very pale olive-greenish, in some lights opalescent ; costal edge pale ochreous ; cell-dot slightly darkened, quite inconspicuous ; lines fine, white ; antemedian nearly obsolete except posteriorly, weakly bisinuate ; postmedian obsolescent costally, faintly crenulate and very slightly incurved in anterior part, still less crenulate (virtually straight) and about parallel with termen in posterior.—*Hindwing* rather broad for an *Iodis*, the tail at R^3 not very long or acute ; M^1 stalked ; nearly as forewing but with the postmedian equally distinct throughout, weakly bent about R^3–M^1.

Underside opalescent whitish.

Hpimaw Fort, June 1923, 4 ♂ ♂ ; Htawgaw, 1 ♀ received at the same time (just possibly erroneous in the labelling). Also 2 ♂ ♂, 1 ♀ from Hpimaw Fort 14–18 August, 1923, rather smaller, evidently representing a second brood ; ♀ palpus smoother, with terminal joint more elongate (nearly 1). I refer here further two faded ♀ ♀ from Turzum Tea Estate, Nagrispur (O. Lindgren) sent by the Agricultural Research Institute, Pusa.

Near *xynia* Prout (*Nov. Zool.*, xxiv, 301) in coloration, etc., much broader winged, forewing with SC^1 not anastomosing with SC^2, postmedian line more proximal, less dentate, hindwing with tail shorter. From *delicatula* Warr. the obsolescence of the cell-dots immediately distinguishes it ; also larger, broader-winged, greener, the postmedian line less crenulate.

* 18. *Iodis lara* sp. n.

♂, 26 mm. Closely allied to the preceding, possibly a form of it, though the palpus appears (very slightly) shorter and the venation is rather different. Face clearer green. Thorax and wings more bluish green than in that species, the wings perhaps slightly more delicate, more translucent.

Forewing with termen slightly more oblique in *ctila* ; SC^1 about connate, anastomosing shortly with C and with SC^2, DC^3 oblique posteriorly, M^1 well separate ; lines at least as fine as in *ctila*, cleaner white, the antemedian distinct almost to costa, oblique in the opposite direction to postmedian ; postmedian almost parallel with termen throughout.—*Hindwing* with apex slightly sharper than in *ctila* (termen anteriorly not so fully rounded) ; DC^3 strongly oblique, M^1 just separate ; lines very fine, fairly distinct.

Laukhaung, 10, March 1923, 1 ♂ in excellent condition.

In tone and extreme delicacy comparable to *delicatula* Warr., but without the cell-dots, the postmedian less crenulate.

19. *Iodis argutaria* Walk.

Thalera argutaria Walk., *List. Lep. Ins.*, xxxv, 1614 (1866) (N. India).
Hpimaw Fort, June 1923, 1♂, 9–13 August, 1923, 1♀. Seems to be distributed from North India to Formosa.

* 20. *Comostola virago* sp. n.

‘ *Comostola subtiliaria* Brem.’ Prout in Seitz *Macrolep.* iv, 33 (1913) (excl. fig.)

♂, 23–24 mm. ; ♀ 24–28 mm. Face whitish green, with upper third bright red. Palpus short for the genus (in ♂ $1\frac{1}{4}$ in ♀ $1\frac{1}{2}$), with terminal joint proportionally reduced. Antenna pectinate in both sexes, the branches in the ♀ about 4, in the ♂ scarcely less. Crown green, mixed with white at anterior edge of fillet. Hindtibia of ♀ not dilated.

Forewing broad, apex sharp, termen almost straight ; DC only moderately characteristic, SC^1 connate or just stalked, rarely anastomosing with C, R^1 stalked beyond it ; bright green, slightly more bluish than in *mundata* Warr. ; costal margin whitish buff, not spotted ; pattern normal, cell-spot moderate, roundish, red mixed with black, with a white pupil and fine white circumscription ; the lines of white dots rather creamy, obsolete anteriorly, otherwise rather strong (at least the postmedian), scarcely touched with red at their edges ; the postmedian strongly bisinuate as in *mundata* ; terminal red line extremely fine.—*Hindwing* with termen rather full, only very weakly bent in middle ; cell-spot rather larger ; postmedian similar.

Underside much paler, forewing proximally suffused with red-grey, especially near costa.

I have long had this species in manuscript, having discovered that it is not Bremer's Ussuri species (which has longer 3rd joint of palpus and longer ♂ pectinations) and have selected as type a fine ♀ from the Khasis, April 1896, in coll. Tring Mues. Its range extends from Sikkim to West China.

Htawgaw, August 1923, 1 ♂.

Subfamily. **Sterrhinae.**

* 21. *Rhodostrophia similata* (Moore)

Phyletis similata Moore, *Lep. Coll. Atk.*, p. 264 (1888) (Khasis).
Laukhaung, 15, March, 1923, 1 ♀ ; Htawgaw, April to May 1923, 1 ♀.

* 22. *Organopoda brevipalpis* sp. n. (Pl. 1, fig. 7.)

♂, 29–31 mm. ; ♀, 33 mm. Face deep red. Palpus shorter than in the other species, scarcely over 1, with terminal joint $\frac{1}{3}$[1] ; red above, more ochreous beneath. Antennal ciliation rather over 1. Vertex white ; occiput reddish. Thorax and abdomen concolorous with wings. Hindleg much as in *carnearia* Walk., the tibial tuft of the ♂ perhaps less dense.

Forewing with apex slightly sharper than in the other species ; SC^2 from cell (only in the left wing of the single ♀ about connate with SC $^{3-5}$) ; coloration as in *carnearia* or very slightly darker ; markings the same (the cell-mark, which Hampson, *Faun. Ind. Moths*, iii, 451, calls a ‘ dark speck,’ forms in both species a very diminutive annulus, there being a few whitish scales in the centre).—*Hindwing* with the discal annulus smaller than in *carnearia* ; a median shade indicated across or just beyond it, always quite weak.

Underside slightly less pale than in *carnearia*, otherwise similar ; hindwing with the cell-mark smaller, the median shade indicated, the postmedian line rather less incurved at the radials than in *carnearia*.

Htawgaw, early July 1923, type ♂ and 5 others ; Hpimaw Fort, June 1923, 1 ♀, 14–18 August, 1923, 1 ♂.

According to the palpus this species should have been in *Discoglypha*, but in that genus, so far as is yet known, SC^2 of the forewing is invariably stalked with SC^5, not to mention that the cell-mark is *punctiform*. In order to obtain further taxonomic evidence, however, I have submitted the ♂ genitalia to the Rev. C. R. N. Burrows, who finds it a true *Organopoda*, though distinct in the smaller size of the parts and in other details.

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[1] I cannot understand Dr. Turner's measurements (*Proc. Linn. Soc., N. South Wales*, xxxii, 683) for *olivescens* Warr. ♂—‘ $1\frac{1}{4}$, terminal joint $\frac{1}{3}$’ ; in my series it is fully $1\frac{1}{2}$ for the ♀, fully $1\frac{3}{4}$ for the ♂, with terminal joint $\frac{1}{2}$ to $\frac{2}{3}$; in the hitherto known Indian species, considerably longer still.

23. *Synegiodes hyriaria* (Walk.)
Anisodes hyriaria Walk., *List. Lep. Ins.*, xxxv, 1617 (1866) (N. India).

Hpimaw Fort, August, 1923, 1 ♂, 5 ♀ ♀ ; Hparē, late August, 1923, 2 ♀ ♀ ; also a ♀ handed over by the British Museum merely labelled 'Htawgaw.' Range : North India to West China.

* 24. *Calothysanis correspondens* (Hmpsn.)

Timandra correspondens Hmpsn., *Faun. Ind. Moths*, iii, 459 (1895) (Dharmsâla).
Laukhaung, April 1923, 1♀.
A rather weakly marked specimen of this Himalayan species, which further extends its range eastward to Tonkin.

25. *Calothysanis* sp.

Laukhaung, July 1923, 1 ♂, 1 ♀.
Near *convectaria* Walk. (*List. Lep. Ins.*, xxiii, 800) but rather pale, the fringe almost as pale as in *comptaria* Walk. (*op. cit.*, xxvi, 1615) ; possibly a form of one of these species or of the following.

* 26. *Calothysanis oligoscia* (Prout)

Timandra oligoscia. Prout, *Nov. Zool.*, xxv, 79 (1918) (Tibet).
Kangfang, September–October, 1923, 1 ♂ ; Hpimaw Fort, 9–13 August, 1923, 1 ♀.
The ♂ seems to fit well as a small second-brood example of my *oligoscia*, which occurs also on Omei-Shan. The ♀, likewise small, is a beautiful aberration with the pink markings broadly diffused, such as sometimes occurs in *C. amata* Linn. and a few other species, and its reference here is somewhat conjectural.

* 27. *Anisodes absconditaria* Walk.

Anisodes absconditaria Walk., *List. Lep. Ins.*, xxvi, 1513 (1862) (South India).
Hpimaw Fort, June 1923, 1 ♀.
Rather pale (but worn) and not very long-winged, possibly referable to the closely allied *clandestina* Prout (*Ann. Mag. Nat. Hist.*, (9) ii. 414). Both are widely distributed in India and Malaya and there is probably work waiting to be done regarding their geographical variation.

28. *Anisodes* sp. n.

Htawgaw, August, 1 ♀.
In this genus, where the species are often so similar in pattern and the ♂ structure of such paramount importance, I abstain from describing from a single ♀.

* 29. *Scopula segregata* Prout.

Scopula segregata Prout, *Ann. Mag. Nat. Hist.*, (9) iv, 280 (1919) Teng-yueh-ting).
Htawgaw, early April 1923, 2 ♂ ♂.
The 2 ♂ ♂ in coll. Joicey, from which I described this very distinct though unpretentious little species, have hitherto remained unique.

* 30. *Scopula ferrilineata* (Moore) (??)

Runeca ferrilineata Moore, *Lep. Coll. Atk.*, p. 252, pl. 8, fig. 13 (1888) (Darjiling).
Hkamkawn, June 1923, 1 ♀.
A large form or almost certainly close relative, too rubbed to describe. Hindwing with termen rather more rounded, median shade of forewing apparently less oblique, etc.

Scopula ferrilineata is known from Sikkim and Assam and I have seen a race (?) from Tonkin, while *rantaizanensis* Wilem. (*The Entom.*, xlviii, 82), from Formosa, is also closely similar.

* 31. *Scopula bispurcata* (Warr.)

Craspedia bispurcata Warr., *Nov. Zool.*, v, 239 (1898) (Khasis).
Htawgaw, April, 1 ♂.
The specimen is very slightly larger than the typical Khasi form. The species has also occurred in Ceylon.

* 32. *Scopula marcidaria* (Leech)

Acidalia marcidaria Leech, *Ann. Mag. Nat. Hist.*, (6) xx, 99 (1897) (W. China).
Hpimaw Fort, June, 1 ♀.

* 33. *Scopula unisignata* sp. n.

♂, 19 mm. Face white. Palpus blackish on outer side, white beneath. Vertex and thorax white. (Abdomen partly discoloured, probably all white). Foreleg with some smoky suffusion.

Forewing not broad, apex moderately acute, termen oblique, gently curved posteriorly ; SC^1 from apex of areole ; white, with a few scattered black scales ; proximal markings apparently obsolete ; postmedian line faint, light-brown, marked with blackish dots on the veins, those at costa and hindmargin larger ; markedly oblique outward from about five-sevenths costa, sharply angled on R^1, incurved between this and R^3, slightly excurved between R^3 and M^2, posteriorly slightly more oblique inward than termen ; faint double brownish subterminal lines ; black interneural terminal dots only distinct anteriorly ; fringe white.—*Hindwing* with termen very faintly waved, a scarcely noticeable concavity between R^1 and R^3 ; a large subtriangular black cell-spot, extending the length of $DC^{2 \cdot 3}$ and with its apex at R^2 ; a brown median shade from middle of abdominal margin to base of M^1, then incurved, just proximal to cell-spot, obsolete in front of SC ; postmedian formed much as on forewing, not so oblique anteriorly ; outer area much as on forewing.

Underside white.

Hparê, September 1923, the type only.

The forewings may be a little rubbed, but can never have been strongly marked ; the fringes are rather long. The shape of the postmedian line recalls that of the Neotropical *impropriaria* Walk. The large cell-dot of hindwing is characteristic.

34. *Scopula* sp. n.

Hpimaw Fort, 9–13 August, 1 ♂.

Both the forewings are unfortunately too rubbed and torn to allow of a complete description, but as the specimen is otherwise sound and is well distinguishable from any other known to me I append a brief description, in order that the faunistic record may be established whenever the species is met with again.

Expanse about 27–28 mm. (both tips lost). Face black. Vertex pale. Antennal joints scarcely projecting ; the fascicles of cilia long (about 2) ; shaft with blackish dots. Abdomen dorsally suffused with grey. Hindtibia rather strongly dilated, the hair-pencil tinged with fuscous ; tarsus about ½.

Wings rather broad and not very smooth-scaled, suggesting a transition between the *marginepunctata* and *nesciaria* groups, the hindwing scarcely appreciably bent at R^3 ; the pale grand-colour suffused with brown, the blackish irroration moderate ; cell-dots black ; lines brown, with blackish spots on the veins ; antemedian of forewing traceable from cell (not quite 2 mm. from cell-dot) to hindmargin, as oblique as termen ; postmedian of forewing rather distally placed, rather deeply incurved at fold ; that of hindwing less curved than termen, incurved between the radials ; both with the black spot on SM^2 strengthened ; terminal dots strong. Underside weakly marked.

* 35. *Scopula butyrosa* (Warr.) (?)

Idæa butyrosa Warr., *Proc. Zool. Soc. Lond.*, p. 362 (1893) (Sikkim).
Laukhaung, July 1923, 1 ♂ (worn). Known from Kulu, Sikkim and Assam.

* 36. *Scopula complanata* (Warr.)

Ptychopoda complanata Warr., *Nov. Zool.*, iii, 313 (1896) (Khasis).
Htawgaw, early July 1923, 1 ♀; Laukhaung, July 1923, 2 ♂ ♂.
Range about as with the preceding species.

* 37. *Scopula undulataria* (Moore) (?)

Idæa undulataria Moore, *Lep. Coll. Atk.*, p. 252 (1888) (Darjiling).
Laukhaung, 10, March, 1913, 1 ♂.
Rather large and heavily marked.
Known from Sikkim and Assam. It is just possible that *undulataria* and *complanata* may prove forms of a single species and that the present example may be a seasonal or climatic form, hitherto unknown to me.

* 38. *Scopula quinquestriata* (Warr.) (?)

Ptychopoda quinquestriata Warr. *Nov. Zool.*, iii, 314 (1896) (Khasis).
Htawgaw, July 1923, 1 ♀.
Worn, appearing whiter than typical *quinquestriata* and with the cell-dot of forewing obsolete. I only know the species definitely from the Khasis.

* 39. *Scopula detentata* sp. n.

♂, 26–31 mm. Face black, only whitened at extreme lower edge. Palpus black, beneath whitish buff. Antennal shaft more or less mixed with black from near base to beyond middle; joints scarcely projecting, the fascicles of cilia well over 1. Collar ochreous brown. Thorax and abdomen concolorous with wings, the abdomen above with faintly greyer suffusion except at ends. Legs concolorous, the hindtibia and its pencil whitish; hindtibia less long than in *patularia* and *straminea*, measuring not quite 4 mm, tarsus 1 mm.

Forewing shaped as in *nesciaria* Walk. (*List. Lep. Ins.*, xxii, 750); areole rather small, SC^1 stalked beyond its apex; whitish brown, with a tinge of buff *moderately irrorated, with the usual markings of the group (Hampson, *Faun. Ind. Moths*, iii, fig. 200); antemedian line rather faint; cell-dot sharp; median shade moderate (the proximally bent costal end weaker), gently incurved between M^1 and SM^2; postmedian slightly punctuated with black on the teeth, markedly incurved between the radials; subterminal weak but generally continuous; terminal dots small, but better developed than in most *straminea* Warr.; fringe virtually unmarked.—*Hindwing* with termen slightly bent in middle; median shade more incurved proximally to cell-dot than in Hampson's fig. 200; postmedian incurved between the radials, not or scarcely punctuated on the vein-teeth; distal area as on forewing.

Underside glossier and more whitish, not irrorated; forewing in proximal half with fleshy grey suffusion except behind fold, costally at base rather darker grey; its median shade, and especially the postmedian line, fairly strong except at hindmargin; hindwing with cell-dot and weak postmedian; terminal dots on both wings stronger than above, connected by a very fine and very faint brownish line.

Laukhaung, July 1923, type ♂, April–May 1923, 2 ♂ ♂. Also fairly common in Sikkim and Assam.

I separated this species several years ago in the Tring Museum, but postponed publishing it and several others in this excessively difficult group in the hope of being able to work at them more exhaustively. In the species which I determine as *attentata* Walk. (founded on a ♀ from Moulmein, but occurring very generally in the Indo-Malayan Sub-region) the hindtarsus is $\frac{1}{3}$ tibia, the average wing-expanse less than in *detentata*, the tone a little warmer, the markings (except cell-dots) rarely strong, the underside less marked, etc.

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* About as in most of the *nesciaria* group or as in *nigropunctata* Hufn., etc. These common *Scopula* tints—comprehensively termed 'whitish ochreous' by Meyrick and others—seem entirely omitted from Ridgway's 'Color Standards and Nomenclature.' Perhaps his 'cartridge buff' is the least unlike the tone of the present species.

A larger ♂ taken with the above, and a similar ♀ from Htawgaw, April–May 1923, differ in their partly blackened foreleg and the ♂ seems to have a rather longer hindleg ; they must, however, await more material.

40. *Scopula patularia* (Walk.)

Acidalia patularia, Walk., *List. Lep. Ins.*, xxxv, 1633 (1866) (sine loc.)
Trichoclada opsinaria Swinh., *Tr. Ent. Soc. Lond.*, p. 15 (1892) (Khasis).
Htawgaw, July 1923, 1 ♂ ; Laukhaung, July 1923, 1 ♀.

Both the examples are rather worn, but they seem quite to agree with *patularia* in structure and markings.

41. *Scopula brachypus* sp. n.

♂, 36 mm. ; ♀, 34 mm. Near the preceding. Antennal teeth and ciliation in ♂ slightly longer. Hindtarsus of ♂ extremely short (⅙). Forewing with apex minutely produced ; colour and scheme of markings quite as in *patularia*, the postmedian line perhaps less slender, not sharply defined, the subterminal shades fairly well developed, the subterminal itself expanding somewhat at fold ; termen with minute but sharp interneural dots. Hindwing less quadrate than in *patularia*, the termen not bent in middle ; cell-dot larger ; median line proximal to it, not noticeably sinuate in cell ; terminal dots as on forewing. Underside distinguishable at a glance, the terminal line of both wings being replaced by sharp, isolated interneural dots ; hindwing with the postmedian obsolete (usually well developed in *patularia*).

Hpimaw Fort, 14–18 August 1923, 1 ♂, 1 ♀ (a worn ♂, also August, rather smaller, likewise belongs here by shape and structure).

In *patularia* I have always reckoned the hindtarsus to measure ⅕ or rather over, but the distinction is so small that I should not have insisted upon it apart from the other differences. The only other species of the group with minute hindtarsus is the smaller and much paler *straminea* Warr., with termen of forewing rather straighter, of hindwing very slightly bent, lines straighter (especially the postmedian of hindwing), terminal dots weak, etc. Unless these should prove seasonal variations, the validity of *brachypus* seems therefore well assured.

* 42. *Scopula straminea* (Warr.)

Craspedia undulataria ab. *straminea* Warr. *Nov. Zool.*, iii, 310 (1896) (Shillong).

Craspedia undulataria ab. *pulverosa* Warr., *Nov. Zool.*, iii, 311 (1896) (ab.?) (Khasis).

Laukhaung, April–May 1923, 2 ♂ ♂ ; Hpimaw Fort, June 1923, 1 ♂.

Hampson (*Faun. Ind. Moths.*, iii. 433) lumped together under the erroneous name of *remotata* Guen. about eight species, all but one (*invalida*) of the present genus but not one of them bearing any close relationship to Guenée's little species (cf. Prout, *Ent. Mitt.*, iii. 242, *Seitz Macrolep*, iv. 59, Oberth., *Et. Lép.*, xii. 170, pl. cccxcix. fig. 3407). It is therefore not surprising that he has sunk still other species in his Supplements (vide *Journal*, *Bombay Natural History Society*, xii. 82). But I do not understand why Warren, who had a better eye for species, should have regarded his *straminea* and *pulverosa* as aberrations of the smaller, whiter and in several respects quite dissimilar *undulataria* Moore—unless, indeed, he had misidentified the last-named. Bearing in mind, however, that he understood by '*remotata* Guen.' *nesciaria* Walk., *attentata* Walk. and their closest allies, his particulars (*loc. cit.* pp. 310, 311) render *straminea* more than a nomen nudum and with the addition of the note on leg-structure which I have given under *brachypus* the species, as I at present know it, will become intelligible. Of the name-typical (scarcely irrorated) form I know but few examples, though these occur in Sikkim (Mongpo) and Burmah (Bernardmyo) as well as in Assam. A commoner form, looking greyer on account of its stronger irroration, can fairly safely be referred to it as an aberration, agreeing in shape and structure and presenting in the Khasis some rather intermediate examples ; its range is about the same and to it belong Capt. Swann's captures. A third form, rather more doubtfully conspecific, is *pulverosa* Warr., founded on a peculiar, slightly pinkish specimen which has remained unique. ('ab.' (!) *subcarnea* Warr. *loc. cit.*) is a quite different species, with the hindtarsus more than half as long as the tibia.

* 43. *Sterrha semilinea* (Warr.)

Ptychopoda semilinea Warr., *Nov. Zool.*, iii, 414 (1896) (Khasis).
Htawgaw, April–May 1923, 1 ♂, 1 ♀.

* 44. *Sterrha muricolor* (Warr.)

Ptychopoda muricolor Warr., *Nov. Zool.*, xi, 488 (1904) (Tonkin).
Htawgaw, April–May 1923, 1 ♂, 1 ♀, early July, 1 ♂.

Warren founded this species on a single ♂ collected by Fruhstorfer in the mountains of Tonkin (2,000–3,000 feet), associating with it a much worn ♀ which clearly does not belong, but looks to me an ordinary *actiosaria* Walk. The first Htawgaw pair are paler and less unicolorous than the type but apparently conspecific, the July ♂ larger and whiter still, with the markings very weak. I have noted possible records from localities as remote as Borneo and Formosa, which may indicate a widely distributed but rare and much-overlooked species, but much more material will be needed for its elucidation.

* 45. *Sterrha ingloria* sp. n.

♂, 22–25 mm. Face blackish fuscous. Palpus small; brown, blackish-mixed on outer side. Tongue well developed. Antennal joints not appreciably projecting; ciliation even, slightly over 1. Crown dirty white. Collar brown. Thorax and abdomen concolorous with wings; abdomen rather elongate. Hindleg somewhat bent, tarsus about ⅔ tibia; tibia with long, strong tufts reaching nearly to end of tarsus.

Forewing with apex moderately sharp, termen oblique, slightly more curved posteriorly than anteriorly, SC^1 stalked well beyond areole; bone-colour with a tinge of wood-brown, not very opaquely scaled, with slightly darker irroration; lines weakly darker; antemedian slender, indistinct, about midway between base and median, incurved between M and SM^2; median thicker, just beyond the minute blackish cell-dot, very gently excurved anteriorly and incurved posteriorly; postmedian slender, scarcely crenulate, nearly parallel with termen (slightly further therefrom anteriorly than posteriorly), the radial and submedian sinuosities very slight; pale subterminal line very indistinct, irregularly sinuous (much as in *actiosaria* Walk.), the shades which bound it very faint; fringe slightly paler, unmarked, or with the faintest possible indication of darker proximal dots.—*Hindwing* with termen smooth, rounded (only slightly less so between the radials); SC^2-R^1 stalked to about one-half; antemedian wanting; the rest as on forewing, the median shade curving round proximal side of cell-dot, the postmedian sinuosities rather more pronounced than on forewing.

Forewing beneath rather strongly suffused as far as the median shade; underside otherwise nearly as upper.

Hpimaw Fort, June 1921, 7 ♂ ♂.

Near *indeterminata* Warr. (*Nov. Zool.* viii, 25, Simla), but darker, browner, with more strongly marked median shade, more suffused forewing beneath, etc.

* 46. *Sterrha semisericea* (Warr.)

Ptychopoda semiscricea Warr. *Nov. Zool.*, iv, 60 (1897) (Khasis).
Hkamkawn, June, 1923, 1 ♀.

I am not certain that this is anything more than a rather pale, glossy, short-winged form of the following. I have similar examples from Kurseong, Sikkim.

47. *Sterrha actiosaria* (Walk.)

Acidalia actiosaria Walk., *List. Lep. Ins.*, xxii. 750 (1861) (Ceylon).
Htawgaw, 4–10, April, 1 ♀, April–May 1923, 2 ♂ ♂, 8 ♀ ♀, early July, 1923 1 ♂, 4 ♀ ♀, later July, 1 ♂, 1 ♀, August 1923, 4 ♂ ♂, 5 ♀ ♀, undated, 1 ♀; Hpimaw Fort, June 1923, 1 ♀, early July 1923, 1 ♀ (very worn), 9–13 August, 1923, 2 ♀ ♀, 14–18 August 1923, 1 ♀; Hparè, end of August 1923, 3 ♀ ♀.

It has been assumed hitherto that almost all the Indo-Malayan *Sterrha* with the heavily tufted hindtibia belong to a single, rather variable species and I am not yet in a position to say that this may not be the case, although I have made occasional desultory attempts to unravel the tangle. Its range, in this sense, would be a very wide one—Ceylon, India, China, Tonkin, Malay Peninsula, Borneo, Java, Bali, ? Sambawa, ? Saleyer, ? Celebes, ? Talaut. The variations in the tone of colour and the strength of the markings, even in a single locality, would not be greater than in several other species of the genus, but the differences in breadth of wing are suspicious ; yet the occurrence of some intermediates makes sortation very difficult until some thorough anatomical investigation can be taken in hand. At a very small contribution to the possible future elucidation of the assemblage, I give a few notes on Capt. Swann's captures. The early specimens from Htawgaw (up to July) vary much in size, but might be called on an average fairly large ; the wings are rather elongate, the coloration generally rather warm. The April-May ♂ ♂ (one especially) show in the hindtibial tufts a considerable admixture of dark greyish fuscous, which is less manifest in the July specimens. The August specimens from the same locality are all small and the ♂ ♂ look a trifle broader winged and have the postmedian line rather sharper—in fact altogether somewhat suggest the *Xenocentris* group ; the tibial tufts again show a little variability in colour. The Hpimaw Fort specimens are of medium size, on the whole rather pale and clearly marked. The Hparē, on the other hand, rather large and dusky.

48. *Sterrha* sp. (vix praec. ab. ?)

Htawgaw, April-May, 1923, 1 ♂.

Very small, rather pale and still more *Xenocentris*-like than any of the above, perhaps related to *decidua* Warr. (*Nov. Zool.*, vii, 107) and *denudaria* Prout (*Seitz Macrolep.*, iv, 127.)

49. *Sterrha* sp.

Htawgaw, April-May 1923, 1 ♀ ; Fenshuiling Pass (4 miles from) early July 1923, 1 ♀.

Perhaps the Indian race or representative of *invalida* Butl. (Japan). I have seen the same form (or nearly so) from Assam.

* 50. *Sterrha aequisinuata* (Warr.)

Ptychopoda aequisinuata Warr., *Nov. Zool.*, v, 242 (1898) (Khasis).

Htawgaw, April-May 1923, 1 ♀.

Excepting a very poor specimen from Bhutan (in *Coll. Brit. Mus.*), I have only seen this species from the Khasis.

* 51. *Sterrha castelli* sp. n. (Pl. 1, fig. 9.)

♂ ♀, 21–22 mm. Face black. Palpus blackish. Tongue fairly long. Vertex and base of antenna white ; antenna in ♀ slightly, in ♂ more strongly dentate, in the latter with fascicles of slender cilia, well over 1. Thorax and abdomen concolorous with wings, above mixed with black-grey, especially on wing-tegulae. Hindtibia in ♂ slightly swollen, especially posteriorly (where it is clothed with a hairtuft much as in *protensa* Butl.) ; tarsus over ½ ; a long pencil from femorotibial joint, reaching well beyond middle of tarsus.

Forewing with apex acute, termen almost straight, scarcely noticeably sinuate inward in anterior part ; areole moderately long, SC^1 from its apex or stalked just beyond, R^2 well before middle of DC ; ochreous, more fleshy or rufous than in *protensa*, with minute dark irroration; base and proximal part of costa darkened ; antemedian line indistinct, oblique ; cell-mark not very conspicuous ; median shade just beyond, nearly straight ; postmedian sharper, placed as in *protensa* ; very faint indications of dark subterminal clouding in the radial and submedian areas ; a thin dark terminal line in the ♀ ♀, less strong than in the nearest allies, in the ♂ partly obsolescent.—*Hindwing* with termen slightly sinuous ; median shade continued, just proximal to the cell-dot ; postmedian fine, more irregular than on forewing, somewhat angled outward on most of the veins, especially on R^1, sinuate inward between R^1 and R^3 ; terminal line as on forewing.

Underside paler, the forewing suffused with smoky shading in and around cell ; cell-dots and postmedian line nearly as above, terminal line often almost obsolete.

Hpimaw Fort, 14–18, August 1923, type ♂ and 3 ♀♀, 9–13 August 1 ♂, early August, 1 ♀ (rather broad-winged) ; Hparĕ, September 1923, 1 ♀ (worn, with the vertex appearing less white).

The British Museum possesses a closely similar ♀ from Sikkim, August 1909 (F. Moller), rather more darkly shaded (e. g., costally), rather less rufescent in tone and with the median shade of the forewing crossing the cell-dot ; probably conspecific.

* 52. *Sterrha acuminata* (Moore)

Janarda acuminata Moore, *Lep. Coll. Atk*., p. 265 (1888) (Darjeeling).

Htawgaw, 4–10, April 1923, 1 ♀.

Differs from Moore's type in some minor details, the vertex being slightly browner, the termen of forewing perhaps scarcely so oblique, the median shade heavier, especially on hindwing, the postmedian slightly stronger, the terminal cloud less developed. From *castelli* it differs in its rather differently shaped wings, its coloration and especially the heavily blackened termen.

* 53. *Sterrha falcipennis* (Warr.)

Idæa falcipennis Warr., *Proc. Zool. Soc. Lond.*, p. 362, pl. xxxii, fig. 11 (1893) (Sikkim).

Laukhaung, April–May 1923, 1 ♀.

* 54. *Sterrha rubridentata* (Warr.)

Eois rubridentata Warr., *Nov. Zool.*, iii, 112 (1896) (Khasis).

Htawgaw, April–May 1923, 1 ♀.

More purple (less rosy) than in the examples from the Khasis—hitherto the only known locality.

* 55. *Sterrha lamprotis* sp. n. (Pl. 1, fig. 8).

♀, 21 mm. Face black. Palpus slender, on outerside black. Vertex, antenna and thorax pale (as costal part of forewing) ; collar brown. Abdomen above blackish. Legs pale, the foreleg tinged with fuscous. Wings rather broad, shaped much as in *Lipomelia subusta* Warr., the colours also similar, but with the ground-colour of the forewing slightly paler and still more glossy.

Forewing with areole ample ; an ill-defined purplish-fuscous (slightly black-speckled) hindmarginal cloud as far as the median shade ; a brown shade between this cloud and cell ; lines blackish, the antemedian only showing on the brown shade ; postmedian weak except towards hindmargin, excurved between R^2 and M^2, strongly inangled just behind M^2 ; median shade brown, just beyond the curved, brown cell-mark, somewhat confluent with it ; a sinuous brown band outside the postmedian ; fringe long, glossed with blue-whitish ; extremely minute blackish dots at its base.—*Hindwing* predominantly purple-fuscous, in proximal half irrorated with black ; cell-mark black, placed on a slightly paler brown shade and continued as a very fine, slight, sinuous blackish line to hindmargin ; proximal hereto a blackish median band, which is slightly angled outward about M^2 ; terminal area very narrowly pale (like ground-colour of forewing) ; fringe as on forewing.

Underside less variegated ; pale brown-grey, with cell-marks (on hindwing concise), vague dark median band and band beyond the postmedian ; forewing also with the postmedian itself fairly well defined and reaching the costa, and with some slight proximal suffusion.

Htawgaw, August 1923, the type only.

* 56. *Sterrha ocnera* sp. n.

♂ ♀, 17–20 mm. Superficially similar to *vacillata* Walk. (*List Lep. Ins.* xxvi, 1608, = *phoenicozona* Hmpsn. (*Tr. Ent. Soc. Lond.*, 1895, p. 313), the coloration almost identical, only with the body a little darkened, the borders of the wings duller grey-purple. Palpus slender. Antennal ciliation of the ♂ slightly over 1. Hindleg of ♂ short (the tibia+tarsus very little longer than the femur), clothed with long hair-like scaling, but without the heavy tufts of *vacillata*.

Forewing, as in *vacillata*, with SC^1 stalked beyond the areole; costa similarly spotted; proximal half of wing with the wavy purple lines variable but scarcely ever condensing into bands; terminal band not, or only bluntly, produced proximally on R^2, but forking about R^1, a proximal line running direct to the costa, a narrowed band (much as in *vacillata*) to the apex.—*Hindwing* rather less elongate at midtermen than in *vacillata*; the rough hairy clothing of the ♂ underside wanting; markings much as in *vacillata*.

Underside similar, but generally less definitely marked and duller; forewing proximally with more or less glossy purple-grey suffusion, hindwing proximally weakly marked.

Htawgaw, July 1923, 5 ♂ ♂, 2 ♀ ♀ (including the type ♂), August 1923, 2 ♀ ♀ Hpimaw Foot, early July 1923, 1 ♀; Hparê, September 1923, 1 ♀ (rather worn).

Some aberrations—including the Hparê example—have the terminal borders more or less narrowed, sometimes recalling those of *impexa* Butl. or *paraula* Prout.

Subfam. LARENTIINAE.

* 57. *Eschatarchia lineata* Warr.

Eschatarchia lineata Warr., *Nov. Zool.*, i, 395 (1894) (Japan).

Hpimaw Fort, June 1923, 1 ♂.

A very interesting capture. Warren's type was provided with inexact data, but there can be no question of a false locality, as well authenticated specimens are known from that country, though I think only from S. Hondo and Kiushiu. It may now be looked for from the mountainous parts of Southern China.

* 58. *Chalyboclydon flexilinea* Warr.

Chalyboclydon flexilinea Warr., *Nov. Zool.*, v, 22 (1898) (Khasis)

Htawgaw, 1 ♂ undated.

Hitherto only known to me from two Khasi pairs in the Tring Museum.

* 59. *Hastina azela stenozona* subsp. n.

♂ ♀. Differs from *a. azela* Butl. (*Ann. Mag. Nat. Hist.* (5), i, 403, Japan as follows:—

Forewing with the dark posterior cloud of distal area stronger, confluent with the proximal dark colouring.—*Hindwing* above with the dark band narrower and more distally placed, the white area beyond it somewhat narrowed; beneath with the proximal area, as far as the median line, dark-shaded.

Hpimaw Fort, June 1923, ♂ type, 14–18 August 1923, ♀ allotype.

It is interesting to learn that Hpimaw Fort provide a meeting place for this species and its nearest known relative *gemmifera* Moore, from which it differs in the less extreme shape of the hindwing, non-stalking of M^1 of the forewing and sometimes of the hindwing, clearer apex of forewing, etc.

* 60. *Hastina gemmifera* (Moore)

Acidalia (?) *gemmifera* Moore, *Proc. Zool. Soc. Lond.*, p. 644 (1867) (Sikkim.)

Hpimaw Fort, June 1923, 1 ♂.

* 61. *Agnibesa sanguiniplaga* (Swinh.)

Hydrelia sanguiniplaga Swinh., *Tr. Ent. Soc. Lond.*, p. 655 (1902) (Pu-tsu-fang).

Hpimaw Fort, June 1923, 1 ♂, 9–13 August 1923, 1 ♂, 14–18 August, 2 ♂ ♂, 2 ♀ ♀.

The correct generic position of this lovely little species, hitherto only known in a few examples from West China, has not yet been made out, but I assume it to belong in the immediate vicinity of *Agnibesa*, or at any rate among that small group of genera which connects the *Sterrhinæ* with the *Larentiinæ*.

* 62. *Xanthorhoë placida* Prout.

Xanthorhoë placida Prout, *Nov. Zool.* xxxii, 40 (1925) (Bhutan).
Htawgaw, 14, October 1923, 1 ♀.

63. *Ortholitha latifusata* (Walk.)

Melanippe latifusata Walk., *List. Lep. Ins.*, xxv, 1298 (1862) ('Hindostan').
Hpimaw Fort, June 1923, 2 ♀ ♀.

Both the specimens have vein R^2 of the hindwing arising very little behind the cell-fold, whereas in most of the north-west Indian *latifusata* which I have examined its position—though rather variable—is so divergent from that of *propinguata* Koll. (=*niphonica* Hmpsn.) as to have seemed to justify Hampson's placing them in different genera (cf. *Seitz Macrolep.*, iv. 165). Perhaps these Burmese specimens represent a new race, but I do not at present see anything except the (inconstant) venation on which to found it. *O. latifusata* inhabits the North-west Himalayas and the mountains of West China and may be expected from unexplored Tibet. I have recently (*Nov. Zool.*, xxix, 351–2) referred *ignotata* Stgr., from North Tibet (Koko Nor), to the present species as another race.

64. *Calostigia albigirata* (Koll.)

Cidaria albigirata Koll., in Hügel, *Kaschmir*, iv, 489 (1848) (Masuri).
Hpimaw Fort, June 1923, 1 ♂ ; Htawgaw, June 1923, 2 ♀ ♀.

A widely distributed Himalayan species and it even seems doubtful whether *serpentinata* Led., from the Altai, differs materially.

65. *Apithecia viridata* (Moore)

Cidaria viridata Moore, *Proc. Zool. Soc. Lond.*, p. 661 (1867) (Darjiling).
Htawgaw, April–May 1923, 2 ♂ ♂, 2 ♀ ♀ ; Hpimaw Fort, June 1923, 2 ♂ ♂, 2 ♀ ♀, early July 1923, 1 ♀.

The Hpimaw specimens are rather wasted but seem to belong to this variable species, though their facies slightly recalls that of *divergens* Butl. of North-West India. One of the Htawgaw ♀ ♀ is still more typical, except that the hindwing is rather dusky, as in the unnamed Formosan race. The other three Htawgaw examples are of a form which is so divergent that I shall not be surprised if it prove a separate species. I describe it as : **reliquifascia** form n. (? sp. div.). Smaller (17–20 mm.) Abdomen dorsally less (or scarcely) dark-clouded. Forewing rather paler green ; boundary of basal patch almost straight ; median area remaining predominantly of the ground-colour, with only faint fuscous irroration and fine lines (accompanying the ante- and post-median) and a small blackish distal patch between the radials, running out to an acute postmedian angle at R^3. Hindwing also pale, beneath with the postmedian line rather more angled than usual.

This new form also occurs in Sikkim (Kürseong, May). The species, apart from North India, West China and Formosa, has also been taken in the Nilgiris.

* 66. *Cœnotephria mononyssa* sp. n. (Pl. 1, fig. 19).

♂ ♀, 24–26 mm. Face without appreciable cone. Palpus 1¾, 2nd joint heavilyscaled above and especially beneath, 3rd joint deflexed, well developed (especially in the ♀), but usually partly concealed by the long scaling of 2nd joint. Antenna in ♂ with joints very slightly projecting, ciliate, the ciliation fine, about 1 ; in ♀ minutely pubescent. Metathoracic crest rather strong ; abdominal crests slight. Head and body fuscous, beneath paler ; thorax and abdomen above (except end of abdomen) much clouded with black. Collar more ochreous.

Forewing with both areoles ample ; R^1 stalked, but generally very shortly ; dull green, banded with dark fuscous, almost exactly as in the less bright forms of *Apithecia viridata* or greener *divergens* Butl. (*Ill. Het.*, vii, 118) which latter is—at least by the characters at present used—a second *Apithecia* ; median band either almost solid (except for vestiges of green about the cell-mark) or—in the name-typical form—paler and more green-mixed in its major part, leaving a characteristic *divergens*-like proximal band ; postmedian lines and shading, and the fine white line beyond, only well developed in anterior part, on the other hand with a (generally very conspicuous) thickening of the white between the radials, recalling ‘ *Ypsipetes* ’ *imbrata* Guen. (*Spec. Gén. Lép.*, x. 380), a rather rare species which may prove related but has not yet been critically studied.—*Hindwing* with DC and R^2 rather variable, but the latter approximately central, arising behind the end of cell-vein ; decidedly tinged with brown (almost as in *subrufaria* Warr., *Nov. Zool.* x, 273, East Africa), with indications of a pale postmedian band and a tendency to a darkening of the terminal area, as in the African relatives ; cell-dot minute or obsolete.

Underside likewise tinged with brown, the forewing for the most part suffused with dark grey, leaving an ill-defined paler postmedian stripe, the hindwing slightly paler and more clearly marked than above.

Hpimaw Fort, early August 1923, 6 ♂ ♂, 9–13 August, 14 ♂ ♂, 2 ♀ ♀, 14–18 August, 18 ♂ ♂, 2 ♀ ♀. Also Omei-Shan, 1 ♂ in *Coll. Brit. Mus.* detected among series of *A. viridata*.

Unfortunately, like some of its relatives (notoriously *Perizoma taeniata* Steph.), this species seems to remain in retirement until more or less wasted ; not one of the 42 is in ‘ bred condition,’ while many are badly worn. Regarding the generic reference a few words are necessary. It really belongs to a group, hitherto uncharted, which I have begun to explore with the aid of my valued collaborator the Rev. C. R. N. Burrows and which embraces *Apithecia*, *Xenoclystia*, *Desmoclystia* and the African species which are at present referred to *Coenotephria* (cf. Janse, *Check-List S. Afr. Lep. Het.*, p. 101). As it certainly does not belong strictly to either of the first three and shows moderately close affinity to *C. prasinaria*, it seems best for the present to place it with the assemblage for which I tentatively proposed the name of *Coenotephria* (*Seitz Macrolep.*, iv. 238). The genitalia have 7th segment coremata and no labides (hence are not *Perizoma*) and have generally as a characteristic feature spines recalling those of *Lampropteryx* and *Lyncometra* (cf. Pierce, *Genit. Geom.*, pp. 62 and 63) but arising, not from the ‘ anellus lobes ’ but from distinct bosses on the central area. In *C. prasinaria*, as well as in *Xenoclystia* and *Desmoclystia*, the spine is single ; in *C. mononyssa* there is a group of three. As *Perizoma* is scarcely yet definitely differentiated except by the genitalia, it is probable that some of its Indo-Australian species (at least *P. viridiplana* Bastelb., *Int. Ent. Zeit.*, iv. 342, which is very similar to the most solid-banded forms of *mononyssa*, though with shorter antennal ciliation and narrower band) will prove to belong to the present group.

* 67. *Xenoclystia nigroviridata* (Warr.)

Chloroclystis nigroviridata Warr., *Nov. Zool.* iii, 124 (1896).

Htawgaw, early July 1923, 2 ♂ ♂, 3 ♀ ♀ ; Chui Haw, early July 1923, 1 ♀ ; ? Htawgaw, April–May 1923, 1 ♀ ; ? Hpimaw Fort, June 1923, 2 ♂ ♂.

This species, according to its venation and genitalia, represents in the Indian sub-region the genera *Xenoclystia* and *Desmoclystia* of New Guinea, does not accurately fit into either, but partakes almost equally of the characters of each. As I was possibly premature in separating *Desmoclystia*, and as *nigroviridata* has neither the elongate 8th abdominal segment nor the double origin of SC^1 * of the forewing on which I principally relied, it appears preferable to employ the older generic name. The palpus is rather long and porrect, the ♂ antenna shortly ciliated, SC^2 of the forewing is not stalked, anastomoses at a point (rarely more) with SC^1 and subsequently with SC^{3-5} and SC^1 approaches C, exceptionally even anastomosing at a point. The specimens recorded with query agree in structure but are paler, especially on the hindwing, and present a rather different aspect. They may be seasonal and local modifications, but may well differ specifically. The July examples quite agree with the four Khasi specimens by which alone I previously knew the species.

* 68. *Xenoclystia unijuga* sp. n.

♂ ♀, 20–22 mm. Near *nigroviridata* Warr. Face paler green, more mixed with white. Palpus apparently rather rougher, blacker-mixed. Antenna of

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* It is perhaps almost superfluous to point out that ‘ SC^2 ’ in the original diagnosis (*Nov. Zool.*, xxx, 204) was a misprint or *laps. cal.* for SC^1.

♂ similarly ciliate (ciliation even, not quite 1). Thorax above pale green, mixed with black ; the metathoracic crest rather strong, predominantly black. Abdomen whitish green, very heavily clouded with black on middle tergites. Foreleg partly blackened, with ends of joints pale. Mid and hindleg pale.

Forewing slightly broader than in *nigroviridata* ; SC^1 arising nearer to end of distal areole (i.e. anastomosing more strongly with SC^2), its course normal, not curving forward towards C ; much paler than *nigroviridata* (whitish green) ; markings much simpler ; a very faint sub-basal line, thickening a little anteriorly ; a strong, slightly curved antemedian band, 1 or 1·5 mm. wide at hindmargin, narrowing a little in anterior half, sometimes slightly interrupted at C ; a weaker and rather narrower postmedian mark from costa just beyond ⅔, rather oblique outward, somewhat thickened behind SC^5, terminating just across R^1 ; a small costal dash nearer the apex.—*Hindwing* white, except at costa with slight grey suffusion ; a darker grey spot on R^1 midway between DC and termen.

Forewing beneath rather smoky, with the markings showing through. Hindwing coloured about as above, marked with a cell-spot and curved postmedian line.

Htawgaw, early July 1923, type ♂ ; Hpimaw Fort, June 1923, 1 ♂, 24–18 August, 1 ♀ ; both somewhat damaged.

* 69. *Xenoclystia phaeoloma* sp. n.

♀, 18 mm. Close to the preceding, of which I at first supposed it another brood.

Forewing with SC^1 arising scarcely beyond the dividing wall of areole, curving so as closely to approach C ; antemedian band straighter, edged on both sides (especially distally) with white ; postmedian costal mark rather more proximal (at ⅗), rather broad but much shorter than in *unijuga*, giving rise to a sinuous postmedian band consisting of two or three rows of small and weak vein-dots, which are almost invisible without a lens ; subapical mark also more distal, more longitudinally extended ; costal margin between the dark spots white ; fringe grey, dotted and spotted with black—*Hindwing* grey, with blackish cell-dot.

Forewing beneath rather dark grey, with the markings rather blacker. Hindwing whitish, coarsely irrorated throughout with black-grey ; cell-spot and curved row of postmedian vein-dots deep black ; ill-defined black subterminal spots about the radials and close to tornus. Both wings with a black subterminal line, broken into dots and dashes ; fringes with black central spots and with their tips mottled.

Htawgaw, August 1923, the type only.

* 70. *Euphyia scortea* (Swinh.)

Cidaria scortea Swinh., *Tr. Ent. Soc. Lond.*, p. 493 (1891) (Khasis).

Laukhaung, March 8 1923, 1 ♀.

My long series from the Khasis is entirely ♂ — as is an overwhelming majority of the material which has come on to the market from that locality, at any rate in the *Geometridae* and *Noctuidae*. The ♀ seems to be very rare. The present example is in fine condition, rather grey and well-marked, the hindwing with the whitish subterminal line so strongly expressed as to recall some forms of *variegata* Moore. Without more material it is unwise to opine whether it may represent a local race. I believe the species has hitherto occurred only in North India.

(*To be continued.*)

AN ORIENTAL SPHEX OR HUNTING WASP

BY

MAJOR R. W. G. HINGSTON, I.M.S.

(Continued from page 743 of Volume XXX)

PART II

GENERAL HABITS

Selection of burrow—Forethought in excavation—Manouvres within the tunnel—The paralytic thrust—Purpose of paralysis—Manner of discovering prey—Rhythm of instinct—Comparison with Yellow-winged Sphex.

There are some further points worth consideration with respect to the habits of this solitary wasp. We have seen how she makes use of the cricket's burrow, how she does not, like certain other species, dig a tunnel for her capture, but on all occasions carries it back and incarcerates it in its own den. What reason can we give for this special habit, this refusal to construct a nest of her own ? It is not the usual behaviour of the *Sphegidæ* which as a rule bring their captures to self-constructed holes. But the deviation in this species is a necessary performance, and essential, I think, to the fulfilment of her ends. In the first place the cricket is so massive a burden that, did she, like many allied species, live in a community and scour the surrounding area for prey, then she could never transport her enormous load all the way from its place of capture to her nest. She might have to convey it half a mile or more, and not only would the weight of the burden be excessive, but the cricket would certainly have regained its strength long before she had reached the nest. But why does she not excavate a tunnel for herself close to where the capture is made ? She is certainly sufficiently skilled in excavation, and could easily shape a chamber to her liking in which she might in confidence deposit her egg. But on no occasion does she attempt to do so ; on the contrary she accepts the rough work of the cricket as sufficient for her important needs. The reason is that she is compelled to do so. Were she to fashion a tunnel for itself, it would be a gallery equal to her own dimensions, excellently fitted for her own movements, but how could she manage to bring her burden inside ? Her victim is far more bulky than herself ; it measures fully an inch and a quarter round the girth of its enormous head. Her girth is no more than three-quarters of an inch, therefore she could not drag her capture in. It is clear that she must make use of the cricket's burrow since she could not fashion one for herself that would admit so bulky a prey.

I once observed an incident that showed her limitations, how dependent she was on finding the burrow in order to deposit her load. She happened to have lost her bearings in the excitement of the chase. In every direction she was searching for the burrow, often rushing excitedly about, diving into the grass, thrusting herself into every little rut and furrow in her anxiety to find the hole. But it was all to no purpose ; her memory was at fault, and in the end she gave up the search. Conveniently close was a hollow in the soil ; it was merely a rough and irregular fissure, the remains of a footprint made by some animal when the sand was a soft mud. Into this she dragged her precious burden. Lodging it at the bottom, she layed her egg upon it, went through all the customary formalities of the incarceration, and in the end seemed satisfied with the nature of the tunnel though it was scarcely three inches in depth. It was sufficient to demonstrate the one fact in her instinct. The sphex will never on any occasion dig a tunnel for herself. In her nature she is essentially a solitary vagrant, wandering about in search of victims, uprooting them, paralyzing them, and burying them again in their own lairs. And if for any reason their tunnels are not available, she makes the best use of whatever is at hand, never attempting to shape a cavity for them, but just stuffing them into the nearest hole.

Another point concerns her skill in excavation. Frequently a burrow has a double opening, being so constructed that two separate tunnels lead down to the same retreat. This complication is obviously a disadvantage to the sphex, for when she is descending one of the passages, the cricket will make use of the alternate gateway through which to effect an escape. The wasp is aware of this possibility and acts in a manner which shows definite forethought in order to circumvent her prey. I have observed her, while in the act of breaking through one gateway, frequently run off to the alternative aperture in order to keep a watch on the hole. With buzzing wings and wild with excitement she hurried backwards and forwards between the apertures, at the one digging with all her energy, at the other just making an examination in the vicinity to determine if the cricket had escaped. It was obvious that she realized the complication of the earthwork and the possible exigencies of the chase.

Often after she has broken through the gate of the burrow she remains in the interior for a somewhat lengthy time. It is not a case of the wasp rushing in and the cricket immediately bursting through the gate. What is the purpose of this delay ? It is impossible to see what is taking place beneath the soil, especially at the bottom of so deep a den. But I imagine that a skirmish for position is in progress. The antagonists must change their relative situations. The wasp at her entrance holds the gateway, but she must work her way round to the rear of her opponent before she can drive it out. This, I suspect, is the cause of the delay, for such a manouvre may involve some difficulty within the limits of the narrow tube.

We must also consider another point. Why does not the wasp overwhelm her adversary while she has it imprisoned in the tube ?

Why has she recourse to the uncertainty of the chase, to the battle with a formidable enemy in the open, when she had it cut off in the bottom of a tunnel and had locked its one line of retreat? In the first place she might find difficulty in grasping her victim within the limits of the narrow tube, and we have seen how very secure must be her hold before she can apply her sting. In the second place, she must carefully adjust her position, she must arrange herself accurately around the flank of her victim before she can insert her spear. Such manouvres would be impossible in the rush and tumble of the burrow where all is darkness, the space confined, and the cricket possesses the additional advantage of fighting on its own ground. Hence the long chase and the struggle in the open is to give more room to the operations of the wasp. She must manouvre the cricket to her own field of action before attempting to apply her sting.

I pass to some remarks on the paralytic thrust. The place chosen is particularly suitable for the stab. There is a broad hinge on the ventral surface of the neck; the tissues are loose, the integument is soft, and close beneath lies the nervous substance which it is the purpose of the sphex to reach. That the wasp strikes straight into the nervous ganglion must, I think, be a certain fact. This is evident from the original observations of Fabre made on species with habits somewhat similar to this. But it is more convincing to observe the performance of the deed, to see first the straight determined thrust, then the instant relaxation of the victim, the struggling, heaving, palpitating body struck into the image of death; seeing this, we cannot regard it as an ordinary sting, but a disorganization of the nervous chain. Moreover, its whole length seems to have been uniformly affected. Antennæ, jaws, forelegs, hind legs, the complete neuro-muscular machinery of the insect is deadened by a single stroke.

For a space of three minutes the quiescence remains. It is a coma as deep as overwhelms man at the commencement of the apoplectic state. Absolute unconsciousness no doubt also exists, so that the cricket is in a deep sleep. I lay the insect on its back in order to watch its recovery. The first thing I notice, after the lapse of three minutes, is a gentle movement of a middle leg. It is merely a swaying in co-ordinate tremor, yet the first indication that death has not ensued and that the quiescence is in reality a trance. After another half a minute both middle legs exert themselves. The wall of the abdomen begins to pulsate and vigour is returning to the unconscious frame. At the fourth minute I see the muscles of the trunk contract so as to slightly shift the cricket from its place. In another minute motion has returned to the forelegs, and immediately afterwards I see the palpi quiver and the antennæ commence to vibrate. I now turn the cricket over on its belly. By the eighth minute it has made a weak attempt to walk; the legs work with a natural movement, but their muscular strength is still so enfeebled that they cannot lift it over the soil. In another minute its vigour is distinctly improved. I take it in my hand with the result that it struggles and tries to grip with its claws. By the tenth minute all its appendages have recovered.

When annoyed, it can use them with considerable force, nevertheless it still appears stupefied and overcome ; it is disinclined to exert itself or make a vigorous movement unless it is irritated by being touched. The narcosis is, however, rapidly diminishing ; at the eleventh minute it makes a short run on its own accord, the co-ordination of the muscles appearing exact since it moves with a typical gait. By the thirteenth minute recovery is practically complete. It runs energetically over the sand, is able to advance in characteristic leaps ; to all appearances it is as active as ever, consciousness, strength and sensibility are restored, and at the sixteenth minute I make haste to catch it, for it is burrowing its way into the sand.

What a marvellous resurrection do we not witness here. An insect has been struck down into the deepest coma and in sixteen minutes it has returned to life. Of course, as M. Fabre has so eloquently shown, nothing but a stroke into the nervous matter could produce these immediate effects. But the picture here presented is somewhat different from that which occurred in his species of sphex. This is a paralysis with a rapid recovery ; the insects overcome by other kinds of wasps remain for weeks in a torpid state. The crickets brought in by the yellow-wing sphex remain in a permanently helpless condition until the growing larva eats away their life. The caterpillars stored by the mason-wasps can move and bend to some degree, but they have lost for ever all power of progression and remain thus paralysed while being slowly devoured. The *Sphex lobatus* produces no such lasting effect. The immediate consequences are equally great, for the coma is instantaneous and complete ; but the permanent consequences vary enormously ; in the one a rapid recovery follows, the other remains paralysed till death.

We cannot but speculate on the nature of the mechanism which produces so wonderful an effect. It cannot be merely a perforation of the brain, for the whole working of the nervous system seems to be devitalized by this single stroke. If I amputate the head of a healthy cricket, in this way I remove the brain, yet the movements of the hind part of the body continue, the legs exert themselves, the abdomen pulsates, none of that complete quiescence follows such as results from the operation of the sphex. Some more widespread disturbance must be caused by the wasp beyond the mere perforation of the brain. The same is indicated by a somewhat different experiment. I extract the victim from the wasp's grip the instant after it has been stung. It is, of course, helpless and absolutely immobile, so I treat it in the same way as I did the healthy cricket and decapitate it through the neck. After the normal period for recovery has elapsed, the separate portions of the divided cricket regain their muscular power ; the legs of the hind part regain their activity in spite of the removal of the head.

We have it on a sufficiently high authority that these wasps make their strokes into the nervous substance in order to bring about these paralytic effects. But what is it that occurs within the nervous chain at the point where it is penetrated by the sting ? Is it a physical disruption of matter, a laceration of the sensitive tissue by the spear, in fact a tearing of the nervous fibres such as happens when a man falls unconscious with a stroke? This certainly cannot be the case. A physical destruction means a permanent disablement, or at least a paralysis until such time as the powers of repair are able to exert themselves and permit of a recovery to a partial extent. It may serve to explain those other examples, for in them the enfeeblement is a lasting condition from which they never emerge. But we cannot accept its interpretation here. Recovery is far too rapid and complete for any disruption of nervous tissue to have occurred. There is nothing analogous between the production of this quiescence and the onset of a paralytic stroke in man.

Then it may be that the fluid which the wasp ejects has a chemically devitalizing influence over the nerves. I mean that it may act like some destructive poison, paralyzing by the pressure of acute congestion or by its actual corrosive power over the cells. Again I doubt the probability of such an explanation. If this delicate tissue of the nervous system was overcome by the violence of such chemical effects, then restoration of function could not occur in a few minutes, nor could it be so wonderfully complete.

There seems to be but one explanation of the facts. The wasp injects an anæsthetic fluid, a substance which has the power to paralyze nerve tissue without causing any destructive effects. Moreover it is a fluid which is but temporary in its action. As soon as it has become diffused and has left the part then recovery begins to take place. I regard it as somewhat similar to the cerebro-spinal anæsthesia which the modern surgeon so frequently employs. He injects his fluid into the spinal tube; there follows a paralysis of the parts controlled, and the surgeon has no doubt that recovery will follow as soon as the anæsthetic has diffused away. This, I think, is a true analogy with the operation performed by this species of sphex. She too performs a kind of cerebro-spinal anæsthesia, producing, like the surgeon, a paralysis for the time, merely rendering her subject helpless until she has fulfilled her ends. But the sphex is even more efficient than the surgeon in the performance of this subtle act. The surgeon must confine himself within certain limits. He can with safety paralyze a large portion of the trunk, but he dare not by such means produce unconsciousness. This would require an injection at so high a level that he would interrupt the working of those vital centres on which the continuation of life depends. The sphex has attained a higher efficiency and is not limited by the level of her stroke. She can make it so as to deaden the whole of the system; anæsthesia, paralysis and complete unconsciousness are her more wonderful results.

One last point with respect to the stinging operation. To what end is this wonderful instinct directed? What is the purpose which the wasp has in view when she makes this vital stroke? It cannot be in order to render the cricket helpless for her larva, since we have seen how rapidly its recovery takes place. Nor has she any intention of destroying her victim, for her larva must have living flesh. All she desires is that quiescence should last for a time. It is an expedient to serve the purpose of the moment, a means of quelling a powerful capture in order to permit its transportation to the lair. Did she not paralyze it, she would be unable to move it; she could never control the struggles of the monster if it resisted every inch of the way. This seems to me the only outcome of the deed. Nature is economical in all her operations. She has given to the wasp the wonderful power of rendering her prey completely inert, but there is no prodigality of the precious poison, since paralysis will only last for a sufficient time to permit the wasp to get her victim to its den. With many other kinds of wasps the purpose seems different, for they induce a permanent paralysis probably for the benefit of the developing grub. But in this case the resurrection is far too rapid for any such explanation to apply.

It may seem fruitless to discuss a more difficult point, namely her method of finding her prey. The faculty obviously resides in the antennæ, but is it through any intelligible action, or do these organs possess some special sense which is beyond our power to understand? Let us watch her again in her examination of the soil. The antennæ never cease to apply themselves to the work; we see them now touching, then delicately bending, then rolling themselves into graceful spirals, continually altering at each gentle pressure as they carefully test and explore the soil. They, it is clear, are the organs of perception. Is it possible to tell anything of the information they supply? It is often said that the antennæ have the faculty of smell, so it may be that the sphex scents out her quarry in the same way as a dog discovers its prey. The Hymenoptera certainly have good olfactory powers. Ants of all kinds appreciate perfumes, and numerous experiments have strengthened my belief that they follow one another by scent. The mason wasps recognize the odour of camphor and pass into a state of wild excitement if they find a fragment of it in their cells. Consequently the probabilities are all in favour of the sphex being possessed of an olfactory sense. But there are certain reasons which make it difficult to believe that she is guided in her discoveries by the faculty of smell. For example, I place a cricket on the sand a few inches from a wasp when in search of prey. In her explorations she comes almost on top of the cricket; it lies motionless crouching in a rut where, no doubt, it hopes to remain unseen. If it moves in the slightest the wasp instantly spies it, raises and oscillates her body in excitement as though preparing for a forward rush. But while the cricket remains still, she seems oblivious of its presence. Though it may be little more than an inch away, yet she passes it as if nothing was there. She would scarcely behave in this heedless manner if guided by the faculty of smell. Though quick enough in locating her victim when buried underneath a thick barrier of earth, yet she is quite unable to find it on the surface when only an inch away.

I am inclined to look to a simpler explanation and to believe that the sphex locates her victim by the ordinary sense of touch. Let us follow her very carefully in the details of her search, not merely watching her for a moment at an excavation, nor just noting how she hurries over the soil. Let us pry persistently into her successive actions, pursue her relentlessly from place to place, carefully make record of each spot at which she halts, take notice of the ground which in no way attracts her and observe the special points at which she scuffles and digs. If we do this, then I think we shall gain some inkling as to how she is guided to the cricket beneath. We will soon see that she frequently digs to no purpose; she gets her head and shoulders into the sand, roots in the spot for a minute or two and then is off elsewhere. We will find that she sometimes breaks down empty burrows which contain no cricket within, and that, occasionally, she enters some other insect's tunnel as though she had happened to make a mistake. In the end we will assure ourselves that she is often at fault. Moreover we will observe the important fact that every loose hillock of sand attracts her, especially any pyramid of debris which has been thrown up from below. It is not only the ejections from the crickets' burrows; sand which has been excavated from other causes seems to interest her equally well.

To my mind she distinguishes these ejected hillocks by the ordinary sense of touch. Her antennæ are delicate tactile organs. They are not performing a very difficult feat when they distinguish the harder and more compact surface from the loose and crumbling heaps. Thus, whenever she meets an ejected accumulation, she straightway begins to dig. It is not because she smells or is aware of the cricket, but merely because the sand is loose. She scuffles so as to drive her head and shoulders into it. If she meets a hard resisting stratum, then she knows that she is down upon the compact ground. Therefore she transfers herself a little to one side and again commences to dig. Thus in different spots she repeats the process until she feels that, while she continues to descend, the soil remains comparatively loose. Then she knows that she is in the mouth of the gallery and is advancing along the line of the tube. It is all a matter of simple feeling, merely a tactile sense. It is a capacity to appreciate the difference in sensation between the loose and the compact soil.

More mysterious explanations than this have been offered with regard to other species of hunting-wasps. But this seems to me the simplest interpretation. It explains why the sphex digs so frequently in vain, why she excavates into any loose heap of debris and not only into what the cricket ejects, why she scuffles repeatedly round about the gateway before striking the line of the shaft, why she often runs down an empty tunnel or one manufactured by some other kind of insect, and why she enthusiastically breaks into a burrow which contains no cricket within. She could not commit all these peculiar faults if she were guided by the faculty of smell.

Let us also glance at the implements themselves. The antennæ have every appearance of organs possessing a tactile sense. Each is flexible to a high degree. When at rest it naturally turns outward so as to coil itself into a kind of spiral spring. At the slightest touch it delicately bends, and it is, no doubt, this flexion which originates those impulses that supply the sensation of touch. A tactile sense will thus easily explain what at first seems so wonderful in the operations of the sphex. I see no reason to look to a faculty of smell, still less to any mysterious influence which is beyond our power to understand. Her exploration is all a matter of trial and error. She digs in every loose pile of debris ; more often than not she finds herself at fault, but if the sand remains loose while she persists in her excavation, then she knows that she is on the right road. Touch and sight ; these are the two important senses which guide her in this murderous deed. By the one she discovers the whereabouts of her victim ; by the other she follows madly in the chase and struggles for the deadly blow.

Another point refers to the fixity of instinct. A sphex is hunting over the dusty soil. I have in my possession the object of her chase, a *Brachytrypes* of the desired species which I happen to rob from another wasp. It is a vigorous half-grown example of its class, one which I anticipate that the sphex will instantly attack, and thus give me an opportunity, independent of chance, of witnessing the details of the fray. I throw the cricket in front of the wasp. Here is good fortune such as she has never known. It is the very type of victim that she seeks ; it now lies before her on the open soil ; she can have it without the strenuous labour of excavation and the endless vicissitudes of a doubtful search. It is there on the sand a few inches from her ; just one rush and she can take it in her jaws.

It is clear that she detects this valuable quarry. She lifts herself erect on her forelegs ; her antennæ tremble with the ardour of discovery, and she rocks herself from side to side. She makes a little run at it, follows it up, comes so close as almost to touch it, and I expect to see the deadly drama enacted through my own device. I have chosen a spot which is free from obstructions, a level sheet of the smoothest sand where each detail of the battle can be clearly seen.

But no. All does not follow to suit my desires. The sphex arrives in contact with the cricket, but, strange to say, her mandibles do not open ; for some reason she refuses to seize it though it rests immediately beneath her jaws. The cricket runs off ; the wasp follows it a little further, but again makes no attempt to strike it, and the cricket, in the end, well aware of its adversary, beats a hasty retreat.

I repeat the experiment, hoping against hope that the sphex may be induced to strike. Again and again I see the same result. The wasp quickly spies and recognizes her quarry but stubbornly refuses to attack. I try her at closer and perhaps more favourable quarters. She is digging with her usual outburst of enthusiasm. Beneath her is the entrance to a cricket's burrow, and in all likelihood the inmate is at the bottom of the den. The dust is flying fragments of earth are being torn from their place, she is head and shoulders buried in the debris, and her wings are giving forth an excited buzz as she strives to break through the obstruction at the gate. The one thought in her mind, the object of her enthusiasm, is to get at the monster hiding in its lair. This is surely the most favourable of all opportunities. If I now supply her with the precious object she can immediately satisfy her needs.

I place the cricket an inch behind her. She backs out in order to shuffle away some of the debris. Instantly the prize coming under her notice ; she cannot but observe it, for it is on the very spot where she intends to kick away the sand. She suddenly stops before this valuable discovery, and at the same moment the cricket makes off. For a fraction of a second she appears to be furious, chases it for a yard or so, and I have hopes of being witness to the fight. But the same disappointment again follows. She will burst with enthusiasm over it, glare at it, pursue it a little way, but she will not apply her sting. Very soon I observe her resume her excavation. She will toil laboriously to reach a victim buried in the soil, yet she will not take the one that I offer her though it lies at the cricket's gate. Vainlessly and hopelessly I continue the attempts. Her stern attitude of refusal cannot be overcome. There is only one victim that will satisfy her purpose and that is the one which lies buried in the soil.

Why this strange and unexpected behaviour ? I am saving her hours of strenuous toil by giving her this valuable prey. Before her is the gate which she must hew to pieces, beneath are the dark recesses of the tunnel, the prospect of the skirmish within the cavern and the fight in the open field. All these and other uncertainties must face her before she can secure her prey. Why, therefore, will she not take what is ready to hand, and which she can in a minute overcome ? I look on it as an example of that rhythm of instinct, where each act in the drama must follow each preceding act in a definite and predestined time. Under natural conditions she never meets her victim until she has first expelled it from the ground. There is first the exploration, then the excavation, then the expulsion of the stubborn cricket, then the overwhelming of the prey. These are the links in the sequence of her operations, and this is the predestined order of their course. And this sequence she must follow since instinct moves by an inexorable law. She cannot make her capture until first it is expelled. To do so would be to reverse what instinct has ordained, and that is an impossible feat.

The sphex of Europe, so we are told by M. Fabre, is subject to a similar control. He demonstrates it by one of his simple experiments. The wasp is employed at closing her burrow, having lodged an epihippiger within. The experimenter pushes the sphex aside, rifles the burrow, extracts the capture together with the precious egg. The wasp returns, enters the tunnel and inspects the pillaged cell. But as soon as she emerges she returns to work and continues her task of sealing the burrow though nothing is contained inside. She closes it because such is the task of the moment, for having reached that step in the instinctive sequence, she must of necessity fulfil its demands.

So it is with this Oriental species. Distance does not seem to make much difference in the fundamental basis of the psychology of life. Each species is fixed in its routine of instinct, that marvellous and certain guide.

Nor let us imagine that instinct is at fault in thus binding the operation of the sphex. Just consider for a moment the logical sequence. Think, if the sphex had accepted my crickcet, would she in reality have made a great gain? Undoubtedly it might have saved her much immediate labour, for the work of a moment would have sufficed to kill it, just a rush and a stab since she is an expert at the art. But, further than this, what advantage would she reap? Her victim would lie prostrate on the ground beneath her; she might then commence the work of cartage, but where would she store her spoil? Not having evicted the cricket from its tunnel, she would find herself unprovided with a place of storage, and just burdened with a useless load. We have seen that she cannot dig a tunnel for herself, first because such is not an instinct of her nature, and, in the second place, if she had the intelligence to do so, the victim would be too bulky to bring in. Instinct may thus serve her as a better guide than if she had the capacity to think for herself. But perhaps she might find some superficial cranny, such as I have told how another wasp employed when unable to find the den. Such would be a dangerous and unsatisfactory domicile in which to confide the helpless young. Moreover, it is only a possibility that she would find one, and instinct does not deal in uncertainties and possibilities, but demands that its creatures must follow the road that leads to what is certain and exact. Consequently instinct will not permit an action which might easily end in loss.

The sphex does not reason these simple arguments. She merely feels that she must perform something and thinks nothing of means and ends. Marvellous, infallible instinct guides her and directs her to do the right.

I will conclude with a contrast between this Oriental species and the Yellow-winged Sphex, or *Sphex flavipennis*, whose habits have been so eloquently described by Fabre. The Yellow-winged Sphex is modestly clothed; this Oriental species is a metallic blaze glittering with all the colours of the light. The Yellow-winged Sphex shows some social propensities. A little group of them congregate at some selected site where they live and work within view of one another; it is a community of excavators linked in fellowship by the slenderest of social bonds. This Indian Sphex displays a different tendency. She is an absolute vagrant, always found alone, wanders restlessly over the sand in accordance as she finds the victims of her chase. The Yellow-winged Sphex constructs her own tunnel in which to secure the development of her young. It is a habitation made with some degree of nicety, being divided into separate cells. The Indian species has no such architectural skill; she lives a life of continuous pillage and appropriates for her offspring the crickets' dens. The Yellow-winged Sphex, since she digs her own tunnel, has a special habitation in which to spend the night. The Indian species, on the other hand, must find shelter where she can and at nightfall roosts like a bird in the trees. The Yellow-winged Sphex preys on a smaller species of cricket, hence she is burdened with a lighter load. Consequently she can carry it a greater distance, while, in addition, she possesses the incomparable advantage of being able to lift her burden from the ground. This opens out to her the widest explorations, permitting her to range over a large extent of territory and to establish for herself a settled habitation to which she can carry her victims through the air. The Indian species has lost these advantages. She burdens herself with a load almost beyond her strength. It is as much as she can do to drag it along, and flight is impossible at any account. Hence she can transport it over no great distance, with the result that she must keep to a life of solitude and inter her victim where her contest takes place. There is another little point that results from this difference in size. The Yellow-winged Sphex accumulates a number of victims, storing them all in the same hole. The Indian Sphex keeps to the undeviating rule of a single cricket in a single tube.

Each of the species has its own tactics when engaged in the actual fight. The Yellow-winged Sphex throws the cricket on its back, then with legs astride it, and belly to belly, seizes the tip of its abdomen in her jaws. The Indian species takes her victim as it stands, applies herself so as to curl round one of its flanks, first seizes it by a hind leg, then by a wing, after which she manipulates the stroke. The Yellow-winged Sphex lays her victim low by the insertion of three separate stings. The first enters the neck, the second the thorax, the third is driven into the abdomen; each is believed to enter a ganglion and to have a special paralytic effect. The Oriental Sphex employs a somewhat different strategy. Her first strokes are made towards the thorax and abdomen; they are blows of a superficial and auxiliary nature and do not reach the nervous cord. Her last stab is made into the tissues of the neck; it alone reaches the nervous ganglion and produces a paralytic effect. The Yellow-winged Sphex so strikes her victim that it is paralyzed for the remainder of its life. The Indian Sphex is satisfied with a staggering blow, for after ten minutes her victim is able to walk, in fifteen minutes it attempts to burrow, and on the same day will devour food. One last difference seems to exist in the fixation of the egg. Both species lay it across the cricket's breast, but the Yellow-winged Sphex attaches it further backward between the first and second pair of legs, while the Indian Sphex places it exactly beween the first pair often anchoring it to the base of the leg on one side. Thus we see how each species has its own individuality and how instinct is so rigid in all its actions even to the minute peculiarities of each.

INDIAN DRAGONFLIES

BY

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Part XXIII

(*With 1 plate and 3 text-figures*)

(*Continued from page 857 of Vol. XXX.*)

Genus—CYCLOGOMPHUS Selys

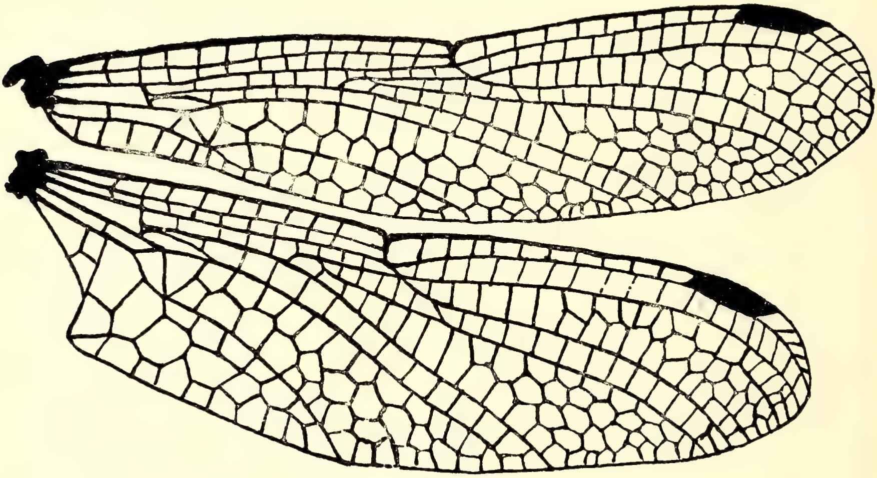


Fig. I—Wings of *Cyclogomphus ypsilon* (Selys.). Male

Insects of rather small size but of robust build, breeding in running water or marshy sources of streams.

Venation. Wings moderately long and broad, base of hind rather deeply concave ; costa brightly coloured ; pterostigma relatively long, nearly one-third the length of distance between node and distal end of pterostigma, braced ; an incomplete basal antenodal nervure in all wings (very rarely absent in one or more wings) ; arc between the 1st and 2nd antenodal nervures ; sectors of arc parallel for some distance, not approximated near origin ; 1 cubital nervure in all wings ; 1 row of postanal cells in forewing 4, occasionally 3 in the hind, 1st postanal cell in latter entire, extending basal for only slightly more than one-third the length of subtrigone ; 2 transverse nervures between *Mi-iii* and *Miv* in the forewing, only 1 in the hind ; forking of *Mi-ii* and *Miii* symmetrical in all wings ; 1 row of cells between *Mi* and *Mia* ; 3 rows of discoidal cells in forewing at level of node ; 2, or more rarely 3 rows of cells posterior to *Cuii* in forewing, this nervure convex and inclining to pectination. Trigone in hindwing relatively long, its costal side about one-third longer than the basal, entire.

Head less narrow and less widened than in *Heliogomphus*, triangular as seen from above.

Legs robust, moderately long, the hind femora extending slightly beyond the base of 2nd segment, armed in both sexes with two rows of moderately widely spaced, short, fine spines, but more numerous in the male.

Abdomen short and robust, segments 1 and 2 tumid, segments 3 to basal half of 7 narrower and cylindrical, apical half of 7 and segments 8 and 9 widely dilated, 10 very small and narrow.

Anal appendages. Superiors apposed, shorter than segment 10, subcylindrical. Inferior deeply bifid, its branches widely divaricate and armed near the apex with a robust spine. Vesicle of penis enormously swollen, globular.

Vulvar scale rudimentary, two small triangular processes at the ventro-apical border of the 8th segment.

Distribution. India, Burma and Ceylon. *C. heterostylus* Selys, *ypsilon* Selys, *vesiculosus* Selys, *verticalis* Selys and *wilkinsi* sp. nov. are from Continental India, *C. minusculus* Selys is from Burma, whilst *C. gynostylus* sp. nov. is from Ceylon.

Of these *C. vesiculosus* appears to be merely a small specimen of *ypsilon*, whilst *verticalis* is evidently not a *Cyclogomphus* at all, but more probably a *Microgomphus*.

Genotype—*Cyclogomphus ypsilon* Selys,

Cyclogomphus ypsilon Selys, Bull. Acad. Belg., xx. (2) p. 62 (1864) ; id. Mon. Gomph. pp. 107, 406 (1857) ; Kirby, Cat. Odon., p. 69 (1890) ; Will. l c. p. 297 (1907) ; Laid. l.c. pp. 390-391 (1922). Fras. l.c. p. 475 (1924)

Male. Abdomen 30 mm. Hindwing 27 mm. (Fig. 1.)

Head. labium yellow, its middle lobe bordered with black ; labrum, ante- and post-clypeus greenish yellow, the former with very fine bordering and basal black ; frons above and in front greenish yellow with a fine transverse black stripe along its lower border in front, and a narrow basal border above, rather more extensive in the middle line ; vertex black ; occiput pale yellow, simple ; eyes bottle green, yellow below and behind, glossy black above and behind.

Prothorax black with a geminate spot on the middorsum of the posterior lobe and a large yellow spot on each side.

Thorax black and greenish yellow as follows :—two broad black mediodorsal stripes narrowly separated by the finely yellow carinal crest, which is itself confluent below with a broad yellow complete mesothoracic collar, the yellow thus forming an inverted 'Y', which gives the insect its name. The two black bands widely confluent above through the medium of the black alar sinus and also outwardly with a broad black humeral stripe which crosses the humeral suture rather obliquely and encloses a small yellow spot above the upper part, thus being split into two arms and forming an upright 'Y'. Laterally a vestigial fine black stripe on the upper part of the first lateral suture, and a complete black stripe on the second lateral suture.

Legs bright yellow marked with black, the tibiae and tarsi black, but the hind tibiae with a small spot of yellow on the distal end of the flexor surface ; hind femora with an inner and outer stripe, broad and confluent distal, rapidly tapering and ending well before the basal end, middle and anterior femora entirely black on the outer side.

Wings hyaline or in old specimens evenly enfumed ; pterostigma pale brown, or in some specimens of the male sex, brown at the centre, pale at either end, and well-braced, over 3 to 4 cells ; nodal index very variable :— $\frac{8\text{–}11}{7\text{–}9}\Big|\frac{11\text{–}8}{9\text{–}8}$, $\frac{9\text{–}14}{10\text{–}11}\Big|\frac{12\text{–}9}{11\text{–}9}$; 4 postanal cells in hindwings.

Abdomen black marked with greenish yellow as follows :—Segment 1 almost entirely yellow, a fine basal bordering of black broadening very slightly subdorsally : segment 2, including the large oreillets, yellow with broad longitudinal subdorsal black stripes which enclose a middorsal bilobed spot, the black broadening at the level of the transverse suture and almost confluent with that of the other side ; segment 3 similar to 2, the black however confluent at the apical border of segment and almost so at the level of the transverse suture, thus cutting the dorsal yellow into a smallish basal spot and a much larger apical spot ; segments 4 to 6 with the subdorsal black stripe not extending nearly to base of segments, there being a broadish yellow complete ring here, at the apex of segments the black broadly confluent over the dorsum, and almost equally so at the transverse sutures ; segment 7 similar, but the black stripe of even width at the transverse suture and not nearly confluent, at the apical border only slightly confluent; segment 8 similar but the black subdorsal stripe broader and extending almost to base of segment; 9 similar but the black stripes well separated throughout their entire length; 10 almost entirely black with a small arrowhead-shaped mark on the dorsum and the ventro-lateral borders narrowly.

Anal appendages. Superiors Libelluline-shaped, almost equal in length to segment 10. Seen from the side cylindrical in the basal half, broadened in the apical half, the extreme apex curved up, the stem of the appendage curved down, the broadened part expanded below into a robust blunt tooth. Seen from above, the appendages are thickened at the extreme base, then constricted and again considerably dilated and finally tapered to an acute point. These appendages moderately closely apposed, enclosing a small foramen between their stems, yellow.

Inferior appendage nearly one-third longer, deeply bifid, the branches widely divaricate, more slim than the superiors, bluntly acute at the apices, tapering, presenting a large blunt tooth at the middle third which is directed down and somewhat inwards, yellow changing to black in the outer half.

Genitalia prominent: lamina depressed, hamules very large, projecting almost perpendicularly from the genital sac, the apices directed slightly forward, pale yellow; vesicle enormously swollen, pyriform, globular, overlapping the basal third of the third abdominal segment, greenish yellow surmounted by a black penis.

Female similar to male, differing only as follows:—Usually larger, abdomen 32 mm. hindwing 29 mm; nodal index as variable as in the male:—
$\frac{7\text{–}12}{8\text{–}9}\Big|\frac{11\text{–}9}{9\text{–}7}$, $\frac{9\text{–}12}{9\text{–}12}\Big|\frac{12\text{–}10}{9\text{–}9}$, $\frac{10\text{–}12}{9\text{–}8}\Big|\frac{12\text{–}9}{8\text{–}9}$. The basal marking on segment 1 broader, segments 2 to 3 similar, 4 to 7 with the black broadly confluent over the dorsum, at the transverse suture and apical border, thus enclosing long oval yellow spots, segment 10 broadly yellow on dorsum.

Vulvar scale small and rudimentary, two tiny triangular processes in close apposition at the base of segment 8, followed immediately afterwards by two raised folds on the ventral aspect of segment 9 which are widely divaricate, and the function of which is unknown.

Habitat. Central India and the Deccan. Type, a male in the British Museum, a paratype in the Selysian collection is labelled 'Cuna', but this is obviously an error for 'Guna', in the Central Provinces, India.

I found this insect moderately plentiful in the marshland at the head of the Katraj Lake, near Poona, Deccan. It rests in long grass and has to be put up by beating. Its flight is short and weak and it falls an easy prey to the collectors net.

Cyclogomphus heterostylus—Selys (*C. heterostyla*) Bull. Acad. Belg. xxi (2) p. 62 (1854), (*C. heterostylus*) Mon. Gomph. p. 106 (1857); Bull. Acad Belg. (2) xxxv., p. 757 (1873); Kirby, Cat. Odon., p. 69 (1890); Will. l. c. p. 297 (1907); Laid l. c. p. 391 (1922); Fras, l. c. p. 474 (1924).

This species is very similar to the last. The differences indicated in the Selysian description, on examination of a large number of specimens, are found to break down largely. Thus no dependence can be placed on the nodal index, which varies widely in this as in *ypsilon* and *wilkinsi*. The bicolourous character of the pterostigma is also found to be shared by adult specimens of *ypsilon*. Size also is a very variable factor and absolutely no reliance can be placed on it. Other minor differences given by Dr. Hagen are also unimportant. The only reliable characters which I have been able to find are the following:—

Transverse black stripe on lower part of frons distinctly thicker; labrum entirely yellow; the stripe on first lateral suture of thorax oblique and confluent at an angle with the stripe on the second lateral suture, so as to form a second black 'Y' on the sides. Finally the anal appendages present some differences:—the superior are more closely apposed and their apices are turned out as well as down, the inferior are relatively much longer, the branches being stouter and tapering more gradually, the tooth at the middle third is smaller, more acute and directed straight up. In spite of these differences, I should be inclined to regard *heterostylus* as a mere race of *ypsilon* were it not for the fact that the two species are found in company at Poona.

Distribution. Katraj Lake Poona, Deccan and Madras, in marshes along the course of the Coomb River. The type, Saunders' collection, comes from the

North of India, locality not stated. Habits similar to those of *ypsilon*, and like it, found on the wing during September and October.

Cyclogomphus vesiculosus—Selys, Bull. Acad. Belg. (2) xxxvi, p. 300 (1873); Kirby, Cat. Odon., p. 68 (1890); Will l.c. p. 297 (1907); Laid. l.c., p. 390 (1922).

This species so closely resembles *ypsilon* that I am unable to find any characters serving to separate the two species. The size is said to be smaller (abdomen 25 mm. hindwing 23 mm.), but this factor is so variable in other related species, that no weight can be attached to it. The legs are described as ' more lined with yellow ', but this also depends on the age of the specimen.

Unfortunately the type, an imperfect male (the last 5 abdominal segments missing), which was in the Moore collection, appears to have been lost, I therefore prefer to regard it for the time being as an unusually small specimen of *ypsilon*.

Distribution. India, locality not given.

Cyclogomphus wilkinsi sp. nov.

Male. Abdomen 34 mm. Hindwing 28 mm.

Female. Abdomen 35 mm. Hindwing 31 mm.

Head; labium bright citron yellow, the midlobe somewhat greenish; labrum bright citron yellow, its base very narrowly black; face bright yellow with a narrow well-defined black stripe separating the frons from the postclypeus; frons unmarked save for a very fine black basal line; vertex black, occiput bright yellow, flat, a little concave.

Prothorax black marked with an anterior collar of yellow and a middorsal geminate spot and a large lateral spot on each side.

Thorax bright greenish yellow marked vividly with black as follows:—two broad dorsal stripes which taper to a point below and outwards, but converging and confluent above, the complete yellow mesothoracic collar sending a fine carinal prolongation upwards which separates them except near the alar sinus. A humeral black ' Y ', the arms of which are of even thickness and of equal length; two lateral narrow black stripes on the lateral sutures, parallel, not extending below the level of the spiracle, finely connected above a bordering line. Unmarked beneath.

Legs bright citron yellow marked with black, the femora almost entirely black within, and with a fine longitudinal black stripe on the outer sides, which in the case of the anterior femora is almost obsolete.

Hind-femora armed with pairs of moderately widely-spaced, fine, short, black spines. Tibial spines short, tibiae with a black stripe on both inner and outer sides.

Wings hyaline, costa bright citron yellow as far as apex of wings, except where the pterostigma intervenes, the latter brown between black nervures, braced, over 4 cells; a basal imcomplete antenodal nervure in all wings; nodal index $\frac{10\text{–}11}{10\text{–}10}\Big|\frac{14\text{–}9}{9\text{–}9}$; 1 row of cells between *Mi* and *Mia*.

Abdomen short and tumid, segments 3 to 6 narrower and cylindrical, black marked with yellow as follows:—segment 1 with the sides and dorsum broadly, enclosing a subdorsal stripe of black, 2 similar, the subdorsal black stripes enclosing a trilobed carinal dorsal yellow stripe, 3 very similar but the dorsal yellow stripe more narrow and nearly divided by the fine transverse black suture, 4 to 6 with a basal ring of yellow which is prolonged in a narrow fusiform dorsal stripe to the apical border of segment and laterally for a very short distance along the ventral border, being separated by a considerable interval from an oval lateral spot, 7 similar but the basal ring much narrower and the ventro-lateral oval spot expanding into a broad lateral fascia especially towards the apex of segment, 8 and 9 with a narrow even dorsal stripe running from apex to base and the sides along the ventral border broadly yellow. Segments 8 and 9 and the greater part of 7 laterally expanded as in *heterostylus*. Segment 10 with narrow dorsal ventrolateral yellow stripes. The intersegmental joints from 1 to 7 finely black, the remaining finely yellow.

Anal appendages. Very similar to those of *ypsilon* but the branches of the inferior relatively longer and black from the lateral spine as far as apex. (Figs. 3, 5 and 6).

Genitalia rather more tumid, lamina slightly larger, hamules bright yellow, longer, less recurved (Figs. 3 and 7).

Female. Similar to the male but the black more extensive. The subdorsal black stripes extend basad as far as the extreme base of segments, thus cutting the basal rings into dorsal and lateral spots. Laterally the ventral oval spots are much more extensive and may be actually confluent with the basal yellow or merely separated by a fine prolongation from the transverse suture.

Habitat. Type and allotype of this beautiful dragonfly at present in my own collection but will eventually be deposited in the B.M. One male and two females taken by Mr. Wilkins and myself along the banks of a small stream at Hunse, Mysore, 12–13. x. 1924. All were settled in long grass after the usual habit of species of the genus.

The species is closely allied to both *heterostylus* and *ypsilon* but differs by its larger size, by the continuous dorsal carinal stripes on segments 3 to 7 and more especially by the complete antero-lateral black stripe on sides of thorax (vestigial in the other species). This latter feature will at once serve to distinguish it, as well as other differences in the appendages and genitalia.

In *wilkinsi* the humerial black 'Y' is formed by the confluence of two distinct black stripes, which are invariably finely but distinctly separated by the yellow ground colour, whereas in other species the humeral black stripe is converted into a 'Y' by the interference of a small upper triangular spot, the arms of the 'Y' being very broadly confluent. Lastly the extreme apices of the superior appendages are turned distinctly inward.

Cyclogomphus gynostylus sp. nov.

Male. (Female unknown.) Abdomen 26 mm. Hindwing 23 mm.

Head: labium a dirty yellow; labrum bright citron yellow, its base finely black; ante- and post-clypeus yellow, as also the frons above but the latter traversed by a black stripe along its crest, from which a short tongue of black runs downward; vertex black; occiput dark ochreous, its border straight, fringed with black hairs.

Prothorax black with a geminate spot on the dorsum of posterior lobe and a large lateral spot.

Thorax black marked with greenish yellow as follows:—a complete mesothoracic collar, a small median spot on the dorsal carina, a broad very oblique antehumeral stripe which runs from the neighbourhood of the alar sinus downwards, steadily broadening, a small upper humeral spot which bisects the black dividing the antehumeral stripe from the lateral yellow and converts it into a black 'Y'. Laterally yellow with a broad black stripe on the postero-lateral suture which send a short oblique branch forwards at its upper part and so forms a second black 'Y' on the sides.

Legs short, hind femora not extending beyond the apical border of segment one, black but the inner sides of the two anterior femora greenish yellow studded with minute black spines; hinder femora largely yellow clouded with black on the outer sides, these armed with two rows of 7–8 short black robust widely-spaced spines.

Wings hyaline. A single row of postanal cells in the forewing, 4 in the hind; sectors of arc parallel from origin; trigone of hindwing elongate as for genotype; 2 rows of discoidal cells in forewing almost to level of node; 1st postanal cell in hindwing entire and not nearly extending inwards as far as proximal angle of subtrigone; anal triangle of 3 cells; base of wing slightly excavate; pterostigma yellow, swollen, short, braced, over 2–3 cells; a basal incomplete antenodal nervure present in all wings; nodal index $\dfrac{8\text{–}11 \mid 13\text{–}8}{8\text{–}9 \mid 9\text{–}9}$.

Abdomen short, tumid, black marked with yellow as follows:—the sides of segments 1 and 2 including the large swollen vesicle, a lanceolate middorsal stripe on segment 2, the sides of 3, but narrowly broken here at the transverse suture, narrow basal complete rings on 4 to 6, a considerably broader one on 7, occupying rather more than its basal fifth, and expanded along its ventrolateral border as far as its apical border, the sides of segments 8 to 10, on the latter also a confluent basal ring. Segments 7 to 9 are rather dilated.

Anal appendages black, highly specialized. Superiors closely contiguous, rather longer than segment 1, shaped exactly like the ovipositor of a *Calopteryx* seen upside-down, the resemblance being completed by a long spine which springs from each appendage near its apex and is directed back and out, Viewed from above these spines are a little divaricate. Inferior broadly cleft, its branches widely divaricate, broad, tapering to a point and presenting an outer robust spine near the apex. The superiors curve evenly downward between the divaricate branches of the inferior. Oreillets large, denticulate behind, yellow.

Genitalia very prominent, lamina small, projecting; hamules narrow, long, projecting down, with the apex recurving forward; vesicle of penis of enormous size, globular.

The anal appendages will serve to distinguish it from all other species of the genus (Figs. 3 and 4).

Habitat. A single male collected by Col. F. Wall, I.M.S., Kandy Lake, Ceylon, 2,000 ft. 4. ix. 1924. The specimen is teneral.

Cyclogomphus minusculus Selys, Bull. Acad. Belg. (2) xlvi. p. 468 (1878); Kirby, Cat. Odon., p. 70 (1890); Will. l. c., pp. 296–298 (1907); Laid. l. c., p. 390 (1922).

Female. Abdomen 22 mm. Hindwing 21 mm. (Male unknown.)

Head. labium yellow; labrum black; rest of face black except for a small spot on each side of the postclypeus; frons yellow along its crest but its base and a prolongation forwards which meets the black on face and front of frons, black; occiput simple, straight, black.

Prothorax black, its posterior lobe yellow.

Thorax black in front and on dorsum, yellow at the sides, marked as follows:—short oblique isolated antehumeral stripes, approximating above, divaricate below, not confluent with the mesothoracic collar of the same colour; laterally a black stripe on the first lateral suture which is confluent at its middle with a similar stripe on the second lateral suture, both stripes moderately thick, the anterior one confluent below with the humeral black stripe.

Wings hyaline, reticulation black, costa finely yellow; pterostigma moderately long, thick, pale between black nervures, over 3 cells (3 mm.); nodal index 9–12/11–10 to forewings.

Legs short, black, inner sides of femora yellow, armed with very short spines.

Abdomen equal in length to the wings, black, brownish beneath, marked and ringed with yellow as follows:—segment 1 yellow with its base narrowly black and interrupted middorsally, 2nd segment with a middorsal trilobed stripe enclosed by broad subdorsal black stripes, the ventro-lateral border yellow marked with a small black spot, the basal articulation finely black, segment 3 black with an interrupted dorsal stripe and a ventro-baso-lateral spot interrupted by the transverse suture, segments 4 to 7 black marked with complete basal rings which occupy about one-sixth the length of segments, remaining segments black, unmarked, 8 and 9 not dilated, 10 very short.

Anal appendages conical, pointed, very small, pale yellow, with a small similarly coloured protuberance between them. Vulvar scale very short.

Distribution. Between Moolai and Moorlut, 4,000–6,000 ft. Tenasserim. A single female in Mr. Wood Mason's collection. Apparently this type was in the MacLachlan collection, as its description was communicated to De Selys by Mr. MacLachlan, but I have been unable to find it in that collection so presume that it has been lost. So long as no details of its venation are known, it will be impossible to place the species with any accuracy.

De Selys gives the following note:—'It is the smallest species of the subgenus (Genus *Cyclogomphus*). It appears to be related to *torquatus* (*Microgomphus*) by the black dorsal carina of the thorax (yellow in all other species). It differs by its smaller size, the absence of a yellow humeral stripe, the narrower mesothoracic collar, which is not prolonged as far as the yellow trochanters of the anterior legs. So long as we do not know the anal appendages of the males of *torquatus* and *minusculus*, there will remain some doubt as to the correct place of these species.' (*Note.*—The male of *torquatus* has since been described by Laidlaw, *vide supra*).

I think that it is fairly evident that the species is not a *Cyclogomphus*, and the diagnosis appears to rest between *Microgomphus* and Group *modestus* of genus *Onychogomphus*. I am inclined to favour the latter, inasmuch as the armature of the hind femora agrees with that group and not with *Microgomphus*, as does also the length of pterostigma.

Genus—Davidius Selys

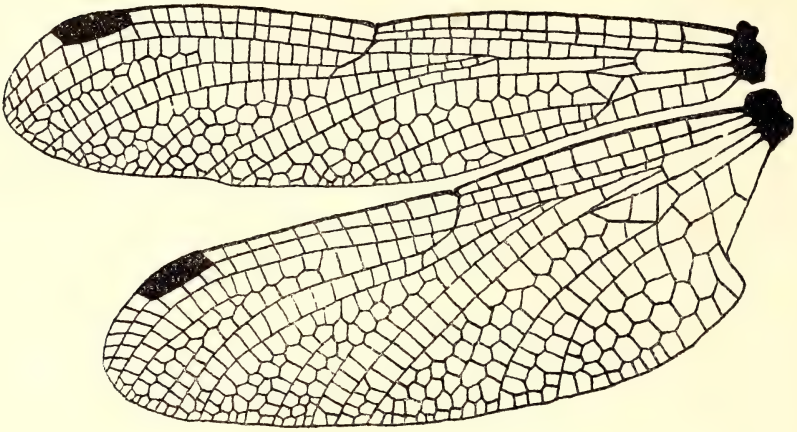


Fig. 2. Wings of *Davidius zollorensis delineatus* subsp. nov. ♂

A large genus of small Gomphines about equal in size to an average *Microgomphus*. Ground colour black with restricted markings of bright or greenish yellow or ochreous ; wings moderately long and broad, reticulation close, the base of hindwing in the male very oblique, rounded in the female. Pterostigma short and swollen, about one-fourth the length of distance between node and outer end of pterostigma, braced, but poorly so and at an angle with the oblique inner end of pterostigma ; 2 rows of cells in discoidal field of forewing to slightly proximal of line of node ; anal loop absent ; usually 2 or 3 transverse nervures between *Mi-iii* and *Miv* in forewing, 1 or more rarely 2 in the hind ; sectors of arc widely separate at their origin and not afterwards approximated ; trigone of forewing sub-equilateral, of the hindwing with costal side much longer than basal (nearly twice the length), distal side distinctly angulated, nearly always traversed by a single nervure which descends from the costal side to the distal, the trigone of forewing more usually entire. Sub-trigones and hypertrigones entire ; usually 2 cubital nervures in the forewing, only 1 in the hind ; *Cui* and *Cuii* divaricate in the hindwing, usually 4 cells between their marginal ends ; *Cui* in forewing only slightly convex, not pectinate ; basal antenodal nervure absent ; *Mia* often difficult to define, only 1 row of cells between it and *Mi* ; 1 row of postanal cells in the forewing, 3 to 5 in the hind ; arc between the 2nd and 3rd antenodal nervures ; base of trigone very close to arc in hindwing.

Head rather large and broad ; thorax robust but short ; legs moderately long, hind femora extending to about the middle of 2nd abdominal segment and furnished with a row of moderately closely-set spines, the distal ones slightly more robust and longer ; abdomen relatively short, tumid at base and anal end, intervening segments thin and cylindrical, segments 7 to 9 not winged.

Anal appendages simple or highly specialized. When simple, the superiors divaricate and tapering, the inferior still more divaricate, cleft into two branches which can be seen from above, jutting out on either side from beneath the superiors. When specialized, the superiors with long curling basal branches, projecting downward to lie on the inferior appendage. The inferior cleft to base, its branches closely parallel and projecting from beneath the superiors, armed with a small medial spine on either side.

In some species, segments 7 to 9 with curious tubercles on the ventral surface. Genetalia prominent, the anterior hamules with 2 branches, the tips of which meet to enclose a small foramina, the posteriors much more robust and ending in more or less curled spines. Lobe of penis very tumid and funnel-shaped.

Distribution and habits. Of the fourteen species at present known, eight occur within Indian limits, and are confined to the montane areas of Assam, Bengal and Sikhim. The remaining species are found in Japan, Indo-China, and China. Of the Indian species, I have been able to examine the type of *D. aberrans aberrans*, in Maclachlan collection, *D. aberrans senchalensis* in my own collection, the type of *D. davidi assamensis* in the Indian Museum, the types of *D. malloryi* and *D. kumaonensis* in the Pusa collection, and lastly many specimens of *D. zallorensis delineatus*, including the type. I am again indebted to Messrs. T. Bainbrigge Fletcher and Chas. M. Inglis for generous gifts and loans of material without which this section could not have been written.

Genotype :—*Davidius zallorensis zallorensis* Selys. Regarding this, Selys was of opinion that *aberrans* might prove to be the female of *zallorensis*, but such has not proved to be the case, otherwise *aberrans* would have become the name of the genotype. Kirby gives *davidi davidi* Selys, as the genotype, probably influenced by the fact that the description of *zallorensis* was written by Hagen and copied by Selys. The species however was given priority by Selys, that of *davidi*, a first-hand description by Selys, following after it, Dr. Ris is therefore correct in giving *zallorensis* as the genotype.

The genus is especially interesting, as including in its venation a curious blending of archaic and modern characters. Thus we find an angulate trigone, and in the hindwing, a very much elongated one, which still finds the necessity of a cross-nervure to support it.

The level of the arc is far out. On the other hand, the basal antenodal nervure is absent, and there is a marked reduction in the cross-nervures between *Mi-iii* and *Miv*, which characters bring it into close touch with series *Gomphus*. In habits, the species resemble *Burmagomphus*, which Indian genus is probably nearest akin to it, at least within Indian limits.

Davidius zallorensis zallorensis (Hagen) Selys, *Quatrièmes Additions. au Syn. des Gomph.* App. Bull. Acad. Belg. II, xlvi, p. 75 (1878) ; Ris, *Sauter's Formosa Ausbeute*, Supplementa Entomologica, No. 5. (1916); Will. Proc. U.S. Nat. Hist. Mus. xxxiii, pp. 286, 287 (1908) ; Laid. Rec. Ind. Mus. vol. xxiv, pp. 388, 389, (1922).

Male. Abdomen 31 mm. Hindwing 27 mm.

Head. Labium pale yellow ; labrum greenish yellow, its extreme base black ; face and frons greenish yellow, base of latter above black ; vertex and occiput black, a pale median yellow spot on former and the hinder part of the latter the same colour.

Prothorax black, its base and posterior lobe yellow.

Thorax black marked with greenish yellow as follows :—a complete mesothoracic collar confluent with a carinal stripe of the same colour, a narrow sinuous antehumeral stripe dilated abruptly above, a very fine humeral line and an upper point. Laterally entirely yellow save for a narrow black line on the hinder suture.

Legs black, rather long, robust, femora brownish, armed with a row of short spines.

Wings hyaline, a little enfumed in tenerals at the base as far as outer end of trigones and along the costa as far as node. Costa black ; pterostigma yellowish in tenerals, dark brown in the adult, 2·5 to 3 mm. long, over 4 cells, braced poorly ; trigone of forewings untraversed ; nodal index 8/12—11/10 ; 3 cells in anal triangle.

Abdomen black marked with yellow as follows :—segments 1 and 2 with a pale yellow middorsal stripe and the sides broadly yellow, segments 3 to 6 with a small baso-lateral and similar apico-lateral spot, borders of 8 and 9 yellowish.

Anal appendages black, the superiors bifid nearly to the base, upper branches divaricate, shorter than half the length of segment 10, apex rounded ending in a short point above, inner branch straight, nearly at a right angle to the outer, inclined abruptly downward, its end curved back slightly towards the base and resting on the inferior appendage. The latter paler, slightly longer, triangular, excavate above, with a transverse tooth on each side, apex blunt and slightly bifid.

Genitalia. Hamules robust, the anteriors long curved spines, posteriors more robust and ending in a tooth which curves inwardly towards its fellow.

Female unknown.

Distribution. Selys gives ' Colony of Zallore ', Himalayas, but I have been unable to trace any such place either on ordnance maps or by local inquiries. Type in the Hagen collection.

Davidius zallorensis delineatus sp. nov.

Male. Abdomen 26 mm. Hindwing 25 mm. (Fig. 2).

Head. Labium and labrum glossy black ; anteclypeus dirty yellow ; mandibles bright citron yellow ; face and lower part of frons glossy black ; frons broadly yellow above, this colour slightly overlapping the foreborder, its extreme base above narrowly black ; rest of head matt black ; occiput with sinuous border, fringed with long black hairs.

Prothorax black with a broad anterior collar and a lateral posterior triangular spot citron yellow. Above just in front of the posterior lobe a tiny geminate spot.

Thorax black marked with yellow as follows :—a complete mesothoracic collar, long, narrow antehumeral spots not confluent with the collar below, nor meeting the alar sinus above, oblique and converging above. A small but prominent upper humeral spot and the sides broadly yellow. The hinder suture is narrowly mapped out in black and there is a vestigial similar line on the anterior suture broadly interrupted in its upper part.

Legs black, unmarked, the hinder femora with a row of moderately closely-set robust spines, the distal ones the larger ; tibial spines short.

Wings hyaline, the bases bright saffron as far out as halfway from base to node. Pterostigma palest brown framed in darker brown, short and dilated, over 3 cells, poorly braced as a rule ; trigones of forewing entire, traversed once in the hind, very rarely entire in one or the other hindwing ; only 1 cubital nervure in all wings ; 4 to 5 rows of postanal cells in hindwing ; usually only 2 nervures between *Mi-iii* and *Miv* in the forewing, and only 1 in the hind.

Abdomen black marked with yellow as follows :—segment 1 with the sides broadly yellow, 2 with the dorsal carina very finely and two large subtriangular lateral spots nearly confluent with each other, the basal one of which involves the oreillet ; segment 3 with a large triangular baso-lateral spot narrowing apicad where it is limited by the jugal suture. Apicad to the jugum is a narrow elongate subapical spot, segments 4 to 8 with a small baso-lateral and a similar apico-lateral spot on each side which become progressively smaller from 4 to 8, remaining segments unmarked.

Anal appendages black, highly specialized. Superiors split into two branches almost as far as base, a superior branch tapering and conical, and about equal in length to segment 10, an inferior which springs from beneath the base of the former and is directed straight down and a little in, long and spatulate, slightly curled. Inferior appendage split as far as its base so as to appear as two separate appendages which are divaricate, tapering and equal in length to the upper branch of the superiors.

Genitalia similar to that of *zallorensis zallorensis*. Lamina very depressed, bulb of penis funnel-shaped, notched at its lip, very prominent.

Female. Abdomen 27 mm. Hindwing 27 mm.

Almost exactly similar to the male. The yellow markings of abdomen more extensive, the yellow on the sides of segment 2 confluent, that on 3 only narrowly divided by the jugal suture, on segments 4 to 6 an additional spot at the basal side of the jugal suture and a similar narrow linear spot placed subapically as on segment 3 of the male.

Nodal index $\frac{13-13}{11-8}\Big|\frac{14-11}{9-10}$. (In the male $\frac{12-14}{10-9}\Big|\frac{13-12}{8-10}$. Venation) otherwise exactly similar to that of male.

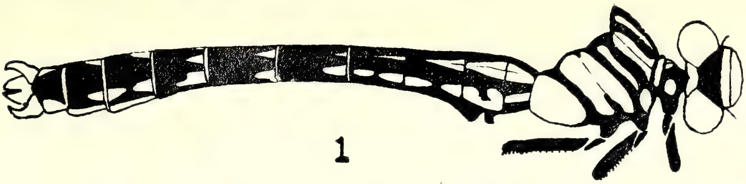
Vulvar scale small triangular, about half the length of segment 9, slightly bifid at apex.

Distribution. A large number of both sexes collected by Mr. Chas, M. Inglis at Gangtok, Darjeeling District in the month of May.

Distinguished easily from *zallorensis zallorensis* by the thoracic markings and by the glossy black face. Possibly the face of the latter in fully adult specimens is darker than as described by Selys. Venation in both species identical. Type in B.M.

Davidius davidi davidi Selys, l.c., Will. l.c. Ris, l.c., Laid. l.c. (1922)

(Male unknown.) Female. Abdomen 34 mm. Hindwing 32 mm.



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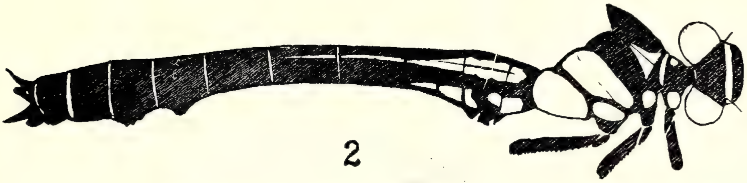

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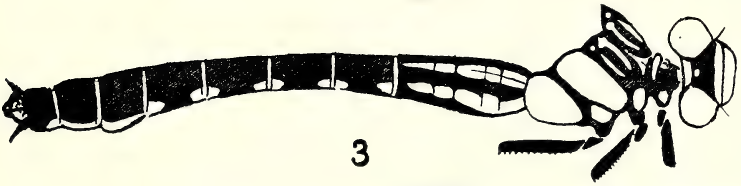

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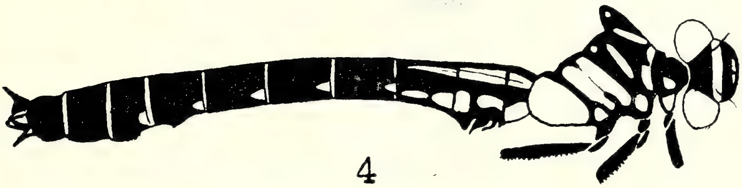

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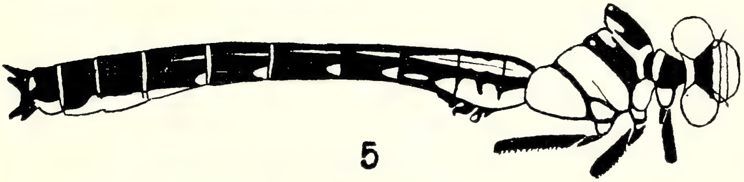

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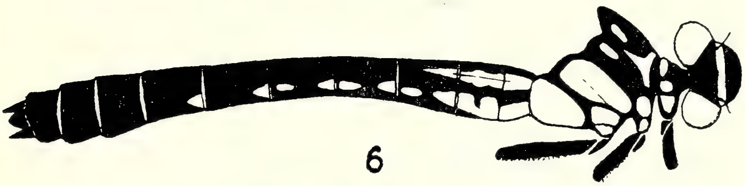

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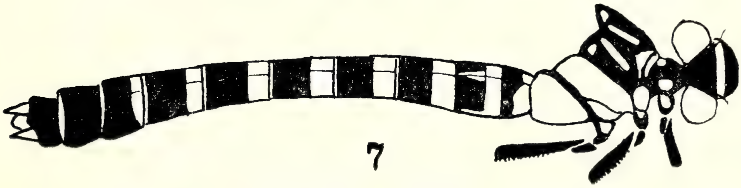


7

EXPLANATION OF PLATE.

DORSO-LATERAL VIEW OF :—

1. *Davidius aberrans* Selys, ♂
2. *Davidius davidi assamnesis* Laid. ♂
3. *Davidius zallorensis zallorensis* Selys. ♂
4. *Davidius zallorensis delineatus* subsp. nov. ♂
5. *Davidius malloryi* sp. nov. ♂
6. *Davidius davidi davidi* Selys. ♀
7. *Davidius kumaonensis* sp. nov. ♀

Head black except the frons, which has a broad dark yellow transverse stripe on its crest ; occiput low, fringed with hair behind.

Prothorax black, its base and posterior lobe dark yellow.

Thorax black marked with yellow as follows :—a short unbroken mesothoracic collar, the lower part of the middorsal carina which is confluent with the yellow of the collar, an upper isolated cuneiform humeral spot and laterally two very broad yellow stripes separated by a narrow black stripe on the postero-lateral suture.

Interalar space also yellow.

Legs black, femora armed as in *zallorensis*, rather long, 8 mm.

Wings hyaline, slightly saffronated, costa black. Nodal index :—13/15–15/15 ; trigone of forewing entire traversed once in the hind ; pterostigma blackish brown, 3 mm. long, stout, over 3½ to 4 cells.

Abdomen black, dorsum of segment 1 and its sides, and a dorsal stripe and the sides of segment 2 yellow ; segments 3 to 5 with baso—and apico-lateral yellow spots, 6 to 7 with basal spots only.

Anal appendages small, the length of segment 10, which is very short. Vulvar scale slightly notched.

Distribution. Thibet. Two females, one of which is the type, in the Paris Museum, collected by the Abbot David after whom the species is named.

Davidius davidi assamensis Luid. l.c. (1922).

Differs from the last by the total absence of the antehumeral cuneiform spot on thorax. In the male, the last five segments are unmarked. Segment 7 has on its ventral aspect, a little apicad to the middle of segment, a small tubercle-like process on the ventral tergite, coated with tiny backwardly directed spines. The sides on the 8th segment have a series of larger spines and the sternite has also a small obtuse projection close after the base.

The markings of the body are a rich ochreous rather than greenish or citron yellow as in other species.

Anal appendages very similar to those of *zallorensis*. Superiors as long as segment 10, conical, curled slightly up and bearing a stout hook-like basal branch beneath. Inferior triangular bifid at apex and furnished with a medial lateral spine on each side.

Venation corresponding to that of *zallorensis*, trigones of hindwings only, traversed. Wings hyaline, slightly enfumed at the bases.

Distribution. Gopaldhara, Sikhim, 1 male and 2 females in the Indian Museum, the male the type.

Davidius malloryi, sp. nov.

Male. Abdomen 29 mm. Hindwing 21–23 mm.

Head. Labium dirty brown or dirty yellow ; labrum and face greenish yellow, unmarked ; frons greenish yellow, its base above broadly black ; vertex black ; occiput greenish yellow, notched at the middle, fringed with long black hairs.

Prothorax black, its posterior lobe and a large subdorsal spot which is confluent with it, yellow.

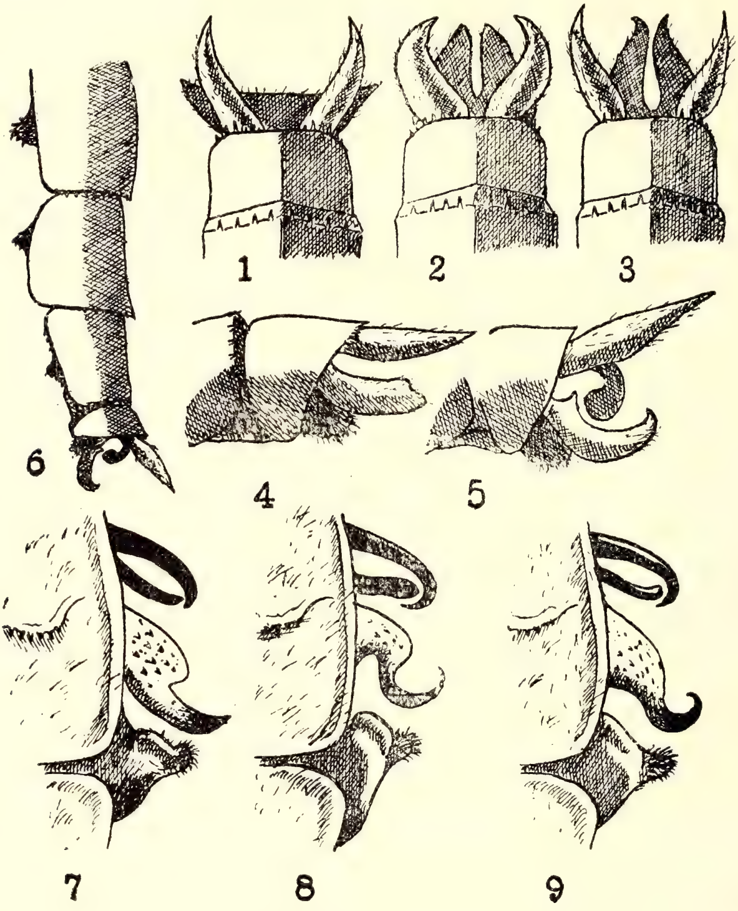
Thorax black marked with greenish yellow as follows :—a very narrow mesothoracic collar confluent with a median dorsal stripe, which narrows above, and is confluent here with two subdorsal, longitudinally oval spots, the three markings together shaped like a ' T '.

The extreme upper keeled part of the dorsal carina black, this alone separating the adjacent dorsal oval spots. A tiny upper ante-humeral point. Laterally greenish yellow with the postero-lateral suture very finely black, as is also the antero-lateral below the level of the spiracle. From this a line runs back to meet the posterior, thus forming a black, inverted ' Y '.

Legs black, femora armed as for genus, the distal spine considerably longer. The femora, underside and dorsum of thorax very hairy.

Wings hyaline, palely enfumed, not saffronated ; pterostigma bright ochreous between heavy black nervures, braced, but the brace at an angle to the oblique end of pterostigma, over 3–4 cells, the hind pterostigma slightly the larger, not nearly as swollen as in other species ; Nodal index $\frac{8\text{–}11}{8\text{–}8}\Big|\frac{9\text{–}8}{8\text{–}8}$, anal triangle with 3 cells ; 2 cross nervures between *Mi-iii* and *Miv* in forewing. only 1 in the hind ; only 1 cubital nervure in all wings ; trigone in forewing always entire.

in the hindwing more often entire than traversed (entire in all wings in 2 specimens, traversed in one hindwing only in 3 specimens, in both hindwings in 2 specimens, in one hindwing and imperfectly in the other of another specimen).



Explanation of Fig. 3.

1. Dorsal view of anal appendages of *Davidius malloryi* sp. nov, ♂. 2. The same of *Davidius aberrans* Selys, ♂. 3. The same of *Davidius zallorensis delineatus* subsp. nov, ♂. 4. Lateral view of anal appendages of *Davidius malloryi*, ♂. 5. The same of *Davidius zallorensis delineatus*, ♂. 6. Terminal segments of abdomen of *Davidius davidi assamensis* Laid., showing ventral processes seen from the side, ♂. 7. Genitalia of *Davidius malloryi* ♂. 8. The same of *Davidius zallorensis delineatus* ♂. 9. The same of *Davidius davidi assamensis*, ♂.

Abdomen black marked with yellow as follows:—segment 1 with a narrow middorsal stripe which is continued over segment 2 nearly to the apical border of segment 3, the sides of segments 1 to 3 broadly, including the oreillets on segment 2, after which the yellow is almost interruped by an invasion of black from above. On segment 3 the lateral yellow broadly interrupted by the black jugal suture, segments 4 to 7 with small triangular basolateral spots, these segments also with the middorsal carina finely yellow, but not extending quite to apex on 5 and 7, the latter segment with the ventral border narrowly yellow, 8 to 10 with this same border more broadly yellow, segment 10 with a dorso-apical spot, the intersegmental joints between the last four segments bright yellow.

Anal appendages black, the inferior yellow within. Superiors divaricate, conical, pointed, equal in length to segment 10 no basal ventral branch. Inferior deeply cleft into two branches which are more divaricate than the superior appendages are from one another, the branches rather tumid at the end, where each ends in a minute upturned point.

Genitalia. Lamina depressed; anterior hamules fine, long, black spines, markedly curled so that the points almost meet the stem again to enclose a fenestration, posteriors very robust, tumid, paler, sloping down and back, contracting rapidly near the apex into a short stout robust recurved spine; lobe inflated, funnel-shaped, glossy black.

Female. Abdomen 29 mm. Hindwing 24 mm.

Almost entirely similar to the male, abdominal markings rather more extensive, nodal index a little higher, trigone of hindwings traversed or entire. Vulvar scate triangular, slightly bifid, apex blunt.

Distribution. Assam. Several specimens, adult males and a single rather teneral female, collected by Mr. T. Bainbrigge Fletcher at Laitlyngkot, Khasia Hills, Assam, 21. iv. 24. The species is closely allied to *aberrans* by its appendages, but is easily distinguished from it, and from all other species by the remarkably specialized dorsal thoracic markings, unique in the family *Gomphidae*, and recalling the bizarre patterns of *Coellicia*.

The species was found settled flat on rocks and stones in the beds of rivers and lay so close that Mr. Fletcher states that he had to 'shovel them off with the rim of his net'. These habits closely correspond to those of *Burmagomphus*, a genus which most closely approaches the genus *Davidius*, at least in considering the Asiatic genera. The narrower pterostigma and the simple form of anal appendages might justify a removal of this species and *aberrans* to a separate genus. In their simple appendages they resemble *Burmagomphus* more closely than do other species of the genus.

I have named this interesting species after Mr. Mallory who so nobly laid down his life in the cause of science on the slopes of Mt. Everest.

Davidius aberrans aberrans Selys, (*Hagenius aberrans*), *Appendix au Troisieme Add. au Syn. des Gomphines*, Bull. Acad. Belg. (2) xxxv, p. 62 (1873); Will. l. c. (1908); Laid. l. c. (1922).

Male. Abdomen 27 mm. Hindwing 25 mm.

Head. Labium, labrum and face entirely yellow; frons yellow, its base above narrowly black; vertex black; occiput yellow, sinuous, fringed with hairs.

Prothorax black, a large yellow spot on each side and the posterior lobe bright yellow.

Thorax black marked with bright greenish yellow as follows:—a short uninterrupted mesothoracic collar which is confluent with two almost confluent dorsal stripes, which lie close to and parallel with the middorsal carina, a sinuous, moderately narrow antehumeral stripe. Laterally broadly yellow, with the postero-lateral suture finely lined with black, lastly the remnants of a similar stripe on the anterior suture extending up as far only as the spiracle. The dorsal carina has some dark shading on each side.

Legs black, coxae yellow, femora armed as for genus with a row of closely-set, evenly-spaced spines, the last 3 or 4 slightly larger and less closely-set.

Wings hyaline, palely saffronated, diffusely so and of a deeper tint at the base; pterostigma reddish brown, swollen, short, broad, over 3 cells; 5 rows of postanal cells to hindwing, 3 cells in the anal triangle; trigones in forewing entire, traversed once in the hindwings; nodal index $\frac{10\text{–}10}{7\text{–}8}\Big|\frac{10\text{–}10}{8\text{–}7}$.

Abdomen black marked with yellow as follows:—a middorsal stripe on segment 1 which is continued over segment 2 to the basal half of 3, the sides of segments 1 and 2 broadly yellow including the oreillets, segment 3 with a subtriangular basolateral spot and a narrow linear subapical lateral spot, 4 with similar but much smaller spots, 5 and 6 with the basal spots only, 7 with a basolateral 'T' shaped spot, 8 with a linear lateral spot broken at the jugal suture and extending downwards at either end, 9 with a minute subbasal lateral spot and its ventral border narrowly, 10 with a large lateral spot not quite reaching the base.

Anal appendages yellow, the superiors divaricate simple, equal in length to segment 10, unbranched, the apices pointed and turning a little inward; inferior appendage triangular, slightly bifid at the apex, which is blunt.

Genitalia. Lamina depressed, lobe tumid, corrugated but glossy black; posterior hamules very robust, ending in a short, stout, slightly upturned recurved spine which turns in towards its fellow.

Female. Abdomen 29 mm. Hindwing 27 mm.

Very similar to the male, differs as follows nodal index slightly higher; trigone of forewing traversed or entire; pterostigma slightly larger, over 4 to 5 cells and slightly larger in the hindwing than in the forewing. The vertex with a small median spot of yellow, occiput low, emarginate and with two prominences behind. Prothorax with a small geminate spot just in front of the posterior lobe (this probably present also in most males).

Distribution. Type a female in the Maclachlan collection, collected by Capt. Lang in North India. Allotype male in the Pusa collection, collected by Mr. T. Bainbrigge Fletcher at Muktesar, Kumaon, Assam, 7,000 ft. May 9, 1923.

The species differs from all others, except *malloryi*, by the simple nature of the anal appendages, and by its markings from *malloryi*. The two species are closely related but, I think, must be considered as distinct species rather than subspecies.

Davidius aberrans senchalensis subsp. nov.

Female. (Male unknown). Abdomen 28 mm. Hindwing 27 mm.

This species closely resembles *aberrans aberrans*, but differs in the following particulars:—

The nodal index is higher $\frac{14\text{–}12\,|\,12\text{–}12}{12\text{–}10\,|\,10\text{–}13}$, the face is black except for a fine obscure submarginal line of yellow on the labrum, and an obscure yellow line on the postclypeus. The occiput is indented on either side and is not emarginate. The humeral stripe is entirely absent. The trigones of the forewings are entire and the bases of all wings are markedly saffronated. The pterostigma in all wings is over only 4 cells. The abdominal markings differ in the following respects:—the dorsal stripe is arrested at the extreme base of segment 3, segments 3 to 7 have a basal and a subapical spot, on 3 and 4 the basal spot is elongate and dumbbell shaped, on 5 to 7 this spot is not dilated at the apical end and on segment 8 appears only a small baso-lateral spot and a smaller triangular dorsal spot at the base, 9 and 10 are unmarked.

Distribution. A single female from Senchal, Darjeeling district, 8,000 ft. May 19, 1924. The characteristic parallel middorsal thoracic stripes, almost confluent with the yellow middorsal carina, show a close relationship to *aberrans aberrans*, but with so many points of difference I do not think that they can possibly be conspecific.

Davidius kumaonensis sp. nov.

Female. Abdomen 27 mm. Hindwing 22 mm.

Head. Labium dirty yellow, labrum black, face and frons glossy black, the upper surface and foreborder of latter greenish yellow, vertex and occiput black, the latter sinuous, notched at its middle.

Prothorax black, its posterior lobe, a geminate spot just in front of it, and a largish lateral spot yellow.

Thorax black marked with bright yellow as follows:—a very short but complete mesothoracic collar, oblique narrow antehumeral stripes not confluent with the collar, a small upper humeral spot, laterally almost entirely greenish yellow, the hinder suture finely mapped out in black.

Legs black, unmarked, hind femora with armature common to the genus.

Wings hyaline, slightly saffronated at the bases. Trigones of forewings entire, traversed usually in the hind; nodal index:—$\frac{13\text{–}13\,|\,15\text{–}13}{11\text{–}10\,|\,10\text{–}11}$; pterostigma pale yellow, stout and short, over 3 cells, braced indifferently.

Adomen black ringed with yellow as follows:— the basal half of segment 1 and 2, the latter with a prolongation along the dorsal carina and another along the ventral border, segments 3 to 8 with rather more than the basal third yellow but the ring narrowing considerably on segments 7 and 8, segments 9 and 10 unmarked, the sutures between the last four segments bright yellow.

Anal appendages and the conical process between them yellow, short and conical. Vulvar scale small, in poor condition owing to the teneral condition of the specimens.

Distribution. Kumaon, 7,000 ft. in May, collected by Mr. T. Bainbrigge Fletcher. Two females, one of which is the type in the British Museum. It is unfortunate that no male was taken of this interesting species which is distinguished from all others by the broad rings on the abdomen. The markings on the thorax resemble closely those of *zallorensis delineatus*, but without the evidence of the male, it cannot be said whether they are at all closely related.

(*To be continued.*)

HUNTING STRAIGHT-HORNED MARKHOR

BY

MAJOR C. H. STOCKLEY, D.S.O., O.B.E., M.C.

(*With three plates*)

If you take the map of Northern India and follow the course of the Indus Valley, you will see that below Attock it flows through a deep gorge as far as Kalabagh, and that it then frees itself from the bondage of the hills and widens out till, fifty miles further down, it is seven miles wide in summer. At Kalabagh there is a ferry to which a small branch line of the railway runs, ending in the station of Mari-Kalabagh. There is now a railway on the right bank of the Indus from Kalabagh to Bannu, but at the time of which I write, the desolate country of barren hills and bad water was undisturbed by such an innovation. A dozen miles west of Kalabagh a range of hills runs parallel to the River Indus whose tops average 4,500 feet in height, with a maximum of 5,200 feet. I had heard that these held a few straight-horned markhor, and chill dawn of a late October day found me getting out of a train at Mari-Kalabagh after a journey which had been an almost continuous nightmare of changes at small junctions and progression in every direction in turn in order to reach my destination. Each change had been enlivened by the blood-curdling growls of my bull-terrier Punch, who strongly resented the approach of any native to my belongings, and was heartily seconded by Sammy the spaniel. The result was that it was impossible to get coolies to carry my kit from one train to another unless I took the dogs twenty yards away and shouted my directions. The two signalled their delight at being let off the chain by hunting the local pi-dogs till they saw preparations being made for breakfast, when they came and squatted on their haunches near my bearer and took a keen interest in the frying of sausages.

Meanwhile my orderly, having enlisted the aid of one of the inferior members of the station staff, went off in search of transport to convey my belongings to the river bank. This arrived later on in the shape of half a dozen small bullocks, and a walk of about a thousand yards over sand and pebbles brought us to the water's edge at about 9 a.m.

Across the river the mud-built town of Kalabagh clustered about the base of a bare rocky hill, the deep shadows of the open doors giving it the semblance of a giant empty wasp-comb.

Much shouting and an hour's patience brought us two boats from the far side, and we landed on the right bank below the town, at a magnificent wide-spread banyan tree which stood on the bank a hundred yards in front of the small dak bungalow.

A couple of hours searching produced five mules and their three attendants, and finally we set off about two o'clock for a tiring

The Chickalli 'tangi'

Camp with Markhor Ground behind it

Markhor Ground

The Dragon's Nostrils

trudge across the bare stony plain, arriving at the foot of the hills at sunset. We pitched camp 500 yards from a big village, which lay close to the mouth of the valley which I had selected on the map as likely ground for Markhor.

While dinner was preparing I interviewed the village elders and, having demanded a guard for the night against thieves and budmashes, made enquiry as to my chances of sport. Only Pushtu is spoken in that district and I found the broad Afridi dialect very trying, accustomed as I was to the clearer enunciation of the Peshawar and Swat valleys. However I managed to elicit the information that I was on the right line, and that some ten miles up the valley was a village where a most wonderful *shikari* dwelt and near which were innumerable Markhor. From all this I concluded that I had a fair chance of seeing a decent buck, and that there was a man who knew something of the most likely places to find one.

Next morning we were off a little after sunrise, and a couple of miles travelling between the cliffs of the rapidly narrowing valley brought us to a collection of mud-walled buildings containing an alum factory, whose profits were derived from precipitating the alum in the local water supply in square tanks, and then digging it out with a spade. After passing I tried a sip of the water above the factory and nastier tasting stuff I have never even thought of. They told me that it was the same all the way up the valley—, a pleasant prospect.

A mile further the walls of the gorge closed in till we moved between two hundred foot cliffs of conglomerate not thirty yards apart. Then we came to the narrowest part of the neck of the bottle, where two loaded camels could not pass, and the marks of the old Sikh gates by which they closed the road at this border post of their domains, were still visible on the walls. Two hundred tortuous yards and we emerged—I almost said with a ' pop '—into a valley a quarter of a mile wide at the bottom, the glare off the sand and white stones being quite startling after the deep gloom of the cleft which we had traversed.

Near the base of the left or southern cliff were two circular cavities about two feet apart and the same in width and depth, from which trickled some evil-smelling water leaving a thick deposit of red and green slime on the rocks below. Our leading muleteer informed me that this was all that remained of a great dragon, which at some far—distant time had troubled the land. Its depredations eventually brought upon it the combined efforts of seventy mullahs, who gathered together, and all uttering a prayer in unison, the dragon forthwith died. Then they returned to their homes leaving the carcase, which was so immense that the stench of its decay bred a pestilence. The mullahs had to be summoned again to complete the job ; this they did by cutting up the carcase, and, having placed the fragments on their prayer-mats, they once again prayed loudly in unison ; whereupon the prayer-mats were wafted up to heaven with their smelly burdens, all that remained being the nostrils turned to rock. From these the blood and slime of the monster still issued, thereby, as Ahmed Khan the muleteer pointed out, proving the entire truth of the story.

I was now able to get an idea of the nature of my shooting ground, and the more I looked at it the more forbidding it appeared. Two ranges of hills ran parallel to each other, and between them was the valley in which we stood. These hills seemed like two great lines of breakers, for the slopes on their north sides are only moderately steep, while on the south they are quite sheer and the tops of the cliffs overhang a little in parts like the curling crest of a wave. It is on these cliffs that the markhor live, and those facing me on the north side of the valley looked almost impossible for anything without wings or suckers to its feet. Whence the wild goats derived their subsistence I could not imagine, until I discovered, on examination with my glasses, that what had appeared as a few thin lighter coloured strata were slopes (set at an angle of about seventy-five degrees) on which grew some withered grass and stunted bushes. These bands of indifferent vegetation were separated by anything from 200 to 1,000 feet of vertical rock, mostly sandstone, and usually ended every two or three hundred yards by an abrupt fault in the formation. Almost everywhere it seemed that a stone thrown from the crest line of the hills would easily reach the valley three thousand feet below.

On the south side of the valley the slopes were much easier, and there were few sheer faces ; in fact it looked much more of a sheep than a goat country, and the local man informed me that a few corial (*Ovis vignei*) inhabited these slopes whereas there were only a very few markhor who lived on the precipices facing the plain.

After plodding uncomfortably over the pebbles and soft sand of the nullah we reached our destination at about eleven o'clock, and discovered that the village consisted of a few mud huts scattered among some most unfertile looking terraced fields on the lowest of which we pitched camp. White visitors were scarce in these parts, and the erection of my tent brought all the inhabitants around to gaze at it. They seemed very poor and ill clad, and enquiry brought to light one of the dingiest as the possessor of the name of Awal Shah, the much-vaunted *shikari*.

I soon entered into conversation with him, and was glad to find that he was young and apparently as keen as mustard. On my promise of ten rupees *bakshish* if he would show me a markhor carrying horns of a length which I measured on my stick, he tested the measurement with the span of his hand and said he knew of a buck carrying even bigger horns, and pointed out a mighty sheer-sided bluff to the north-west of the village as his home. We would have to sleep at least one night near the top of the hill, as it took too long to climb the cliffs to give much chance of success in one day away from camp.

I decided to tackle the problem next day, and asked Awal Shah to produce a couple of men to carry up my sleeping bag and food, whereupon he picked two of his relatives, Jalpara, a handsome well-built youth, and Saikal, a sturdy ruffian, with a bushy black beard. I showed them what I wanted carried up, namely a sleeping bag, small methylated stove and saucepan, a 2-lb tin of Army Ration, a couple of soup squares, cocoa and bread. These were to be taken straight to where we were to sleep and left there while we spied the cliffs.

After lunch I scaled the hills to the south-west with Awal Shah and Saikal, to stretch my legs and look for oorial. As far as game was concerned the afternoon was a blank, but I made the better acquaintance of my two henchmen, and found Awal Shah most likeable and the possessor of considerable knowledge of the habits of our quarry, while Saikal, although not so good a hunter, was equipped with grand eyesight, and a very strong goer.

At 4 a.m. next morning we set forth, and dawn found us wrestling with the first difficult bit of climbing, an overhanging rock in a gully with unclimbable sides. Here my length of limb stood us in good stead, as I was the only one who could reach a decent handhold, and so pull myself over the edge, afterwards hauling up the others with my khud stick. I was glad to show myself of use then, as all three Pathans turned out to be magnificent climbers, and took me into places where I was often in need of a helping hand. An hour's hard work and we parted from Saikal, who carried on the food and blankets to our bivouac, while we turned right-handed out of the gully to inspect a likely place. We no sooner got on the open hill side than I realized a danger I had not thought of, as a piece of rock nearly a foot thick broke away under my weight and nearly gave me a bad fall. Throughout this trip and another later one, this was a constant danger, as much of the rock was of rotten sandstone, and this fact added to the extreme steepness of the cliffs made the climbing much more difficult and trying than the worst tahr and markhor ground I have been over in my Himalayan trips.

We now got on the one of the lateral bands of grass-covered slope which I have previously mentioned as having noticed from below. This, though steep, afforded quite safe walking and Awal Shah led me to the end of it, where he dropped down and crawled to the edge ; an example which I followed. I found myself overlooking a small natural amphitheatre of grass and bush-covered slope, about fifty yards square, and backed by precipices, round the corner of whose western edge we were looking. It seemed an ideal feeding ground but was deserted. However I realized another difficulty. The nearest part of the feed was 300 yards away and a closer approach would have been impossible, so long shots seemed probable. We lay there some twenty minutes hoping for something to show, then Awal Shah sent two large rocks bounding down without result, and we left to try another spot. This sort of thing continued all day varied only by a rest of an hour for lunch, and several rests of lesser duration to pick the spear grass out of my clothes and skin. This abominable vegetable has barbed and pointed seeds which lodge in one's clothes, especially thick tweed such as I was wearing, and then work inwards rendering life a misery until they are extracted.

Towards evening we had reached a point of observation near the top of the main ridge, and lay watching a small patch of broken ground right under its overhanging crest. Suddenly Awal Shah gripped my arm and pointed. A horn had appeared against the skyline, and a fair-sized markhor buck came into view and stood surveying the cliffs below. Then followed a buck who carried trophies such as my heart desired. A grand ash coloured beast, forty inches at the shoulder covered with long shaggy hair and flowing beard and ruff. Not quite so large an animal as his cousin of Kashmir, but every bit as worthy of a sportsman's best efforts, from the even greater difficulty of securing his spirally twisted horns by fair stalking.

The two bucks were fully four hundred yards away ; much too far for a shot. They walked fifty yards nearer and my hopes rose. They then lay down. Slowly the light faded, and then we quietly worked our way back to the gully which was to be our night's lodging.

Here there was a small pool of rain water in a hollow at the back of a wide rock shelf with a fifty-foot drop below it, and precipices closing it in like a three-sided well. The water was sweet and very pleasant after the alum-impregnated stuff I had been drinking down below. There was no danger in lighting a fire as it could not be seen from any point but the hills some miles away, and if the wind carried the scent of it to a markhor it would carry ours too.

At first we were silent over our food, but after I had finished eating and brewed myself a mug of cocoa, I broke the silence by telling Awal Shah that he would get fifteen rupees if I bagged that buck and the others five rupees each. This provoked a chorus of :—' Inshallah, he is already as dead ', and tongues were loosened. For an hour I listened to tales of this patriarch of markhor, who, it seemed had been known for twenty years, and of others. Then the talk veered to tales of the hunting of men and Waziri treachery, for the country we were in lay right on one of the main raiding routes, till finally I declared my intention of getting a good night's rest to prepare for hard work on the morrow.

After a very cold night we moved off as soon as it was light to the ground on the east where we had seen the big buck and his fag, but there was no sign of them. All the morning we crawled and climbed and spied without result, not daring to move freely for fear of showing ourselves. At mid-day I sent Saikal down for a fresh supply of food, and he returned at evening to the bivouac to find us a bit depressed at having failed to sight our quarry. He was undoubtedly there, said Awal Shah, probably hidden in some small cave, and after the evening meal we heartened ourselves with the discussion of a dozen different possibilities of the morrow.

The light of our third day on the hill side was just strong enough to define large objects, and I was lifting my cocoa off the methilated stove, when there came a rattle of stones and a pebble hit me on the shoulder. I looked up and saw, black against the whitening sky, our two markhor standing statue-like on the very crest of the western cliff, not 100 yards above us. For full five seconds we stared at each other, then I dropped the cocoa, spilling half the pot full, and grabbed the rifle from where it leant against the rock beside me. But the old buck knew better than to wait. A bound, another spurt of stones, and they were gone.

THE CREST OF THE MAIN RIDGE WITH AWAL SHAH AND JALPARA

'That's a bad business, Awal Shah,' I said.

'Inshallah we will take his head home with us,' came the reply. A most encouraging fellow, Awal Shah.

It was another twenty minutes before it was light enough to move, and at the outset we were faced by a most difficult piece of climbing in order to reach the cliffs on the west, to which our markhor had crossed over our heads. At first it seemed that we would have to go eastwards and climb up and across by the same way, which would have entailed nearly two hours' hard work. Eventually Awal Shah solved the problem.

'Sahib,' he said, 'you are very tall. If you stood on my hands I think you could reach that crack up there,' pointing to a fissure some thirteen feet above us. I did not like the look of it, but there was no other way, so taking off my chaplis, leaving my feet encased in the soft leather socks only, I prepared for action. Then, Awal Shah leant face inwards against the rock with his arms above his head. Making a ladder of Saikal I stepped on to the palms of Awal Shah's hands while he kept his wrists pressed hard against the surface. I reached the indicated fissure, and by a long stretch to my left got a good foothold on a projecting boss, and thrust my right foot into a hole just above Awal Shah's hands, thus anchoring myself firmly. Then Jalpara came up the human ladder, stepped on to my right foot, climbed over my shoulders, and reached a good wide shelf above. After him Saikal reached my foot and was hauled up by Jalpara. Then I lowered my khud stick with my right hand and hung on with my left. Awal Shah gripped it, swarmed up like a cat, grasped my ankles and was over my shoulders and up to the other two without putting an ounce of unnecessary strain on me. Finally I was also hauled up. An excellent bit of combined work, Awal Shah's effort at the end showing what a fine climber he was. In another twenty minutes we found ourselves on a small plateau which formed the top of the big bluff which Awal Shah had pointed out to me north-west of the village. This bluff was like an immense flying buttress of the main range, and was connected to it by a long knife-edged ridge. Gazing down the valley on the far side of this ridge, I first heard the rattle of stones, and then made out four ewes feeding in the shadow of the cliff. As I watched I saw a wonderful performance on the part of two of them. One ewe walked out on the trunk of a tree which grew straight out at right angles to the cliff, in order to feed on a few leaves at the end of it. A second ewe thought she would also like to sample them, and walked out just as the first ewe returned. The trunk was about four inches thick and disaster seemed certain; but in some miraculous manner they passed each other in safety. How they did it I am unable to say; a jerk and a wriggle being all that I could see. Our buck was not with them however, and some irregular patches far away on the main ridge catching my eye, I got out the telescope and counted twenty ewes and two small bucks lying down or feeding. I thought perhaps the big buck had gone to join them and carefully searched all the intervening ground to no effect. All this time we had been trying north and west, so now we moved on to the south edge of the plateau to search the face of the buttress itself. The edge overhung a good deal, and looking down the concave face was very trying, the glare off the light coloured rock being most dazzling, so we took it in turns to spy. Suddenly Awal Shah called me as I was taking it easy. I came to his side and he pointed downward. On the easternmost of the two spurs which ran out from half-way down the sheer face of the bluff, stood the smaller of the two bucks. There was no mistaking him as he had a peculiar blackish patch on his near hind quarter. Slowly he crossed the face of the cliff to the other spur, and momentarily we expected the big buck to follow him. He reached the western spur, stood a moment on its crest looking round him, and then vanished still alone. What had happened ?

There were two obvious alternatives. Either he had gone to rejoin the big buck or he had just left him. In the first case he might have been driven away by the big buck on the latter joining some ewes early in the morning ; or, in the second case, the big one might have just found some ewes in the broken ground below the spur which the small buck had just left.

The only thing to do for the present was to 'wait and see,' so another hour was spent fruitlessly scanning the ground below.

I then decided on fresh tactics. It was now eleven o'clock and the sun was very hot, so it was fairly certain that our quarry would not make a move till 4 p.m. at the earliest. I therefore sent Saikal to work down the west side of the bluff until he should reach the spur where we had last seen the small buck. He was to spy there till three o'clock and rejoin us near the head of the other spur which was to be our objective. We had exhausted our pool of water in the morning, and I had not been able to fill my water bottle so in any case we had to go down before evening.

We started on our respective journeys, and after two hours' unavailing toil, my party arrived just below the junction of the last spur with the main face of the bluff. Here, as we rested awhile, Saikal appeared above us signalling violently. There was no need to enquire the cause of his excitement ; we started up to meet him. He told us that, having reached the western spur and seen the small buck still moving steadily away, he lay down and spied round for about half an hour. Suddenly he had caught sight of two ewes lying down on the face of our spur. After a while he had made out something in the deep shadow of a rock, and on climbing a little nearer, saw that it was the horns of the big buck sticking out from a recess in which he was lying.

Saikal then pointed to a large rock needle, under the far side of which he said all three markhor were still resting. The only way to reach this was to cross the cliff by a narrow band of earth set at a very steep angle, and with a sheer drop of between 300 and 400 feet below it. We had had no water since early morning, and I knew the traverse would be very trying, so that I would probably arrive at the firing point with a shaky hand and make a heart breaking miss, I therefore asked if there was any chance of finding some water near by.

Jalpara said he knew of a hole in the rock situated in a ravine some 200 feet below us, which might hold a little. I sent him off to try, and in twenty minutes he was back with my water bottle full and we all had a good drink. Feeling a new man I started along the connecting slope, reached the ridge leading to the rock needle, crawled along it and clambered slowly up to the sloping top of the rock. Inch by inch I pushed my head over.

I had got my whole head and shoulders over before I caught sight of a ewe lying on a ledge almost directly under me. I craned a little further forward and saw a second ewe lying nearer in. Then my heart stood still for a second, for beside her a mighty horn projected from underneath the rock. But it was an extremely awkward position all the same, although I was within 80 yards of them.

It is no good shooting at a horn, and at any moment some stray puff of wind might carry the news of our presence to its owner or one of his attendant ewes. Still there was no other possible firing-point, so I got my rifle ready, made Jalpara hold my legs to prevent me slipping over, and waited.

Five minutes of this discomfort was all I had to endure. Some eddy of wind carried the taint of danger to the ewes, for they suddenly sprang to their feet and bolted downhill in a whirl of stones and dust. Their lord and master was not slow to follow, but a hundred yards below me he stopped to glance back. I fired. His heels went in the air and he pitched over the edge. Jalpara let go of my legs so that I nearly dived over head first, and an avalanche of three yelling Pathans shot downhill in a cloud of dust, utterly heedless of my agonized cries not to spoil the head skin by cutting the ‘halal’ too deep, while I scrambled and clambered clumsily in the rear. Of course when I got there his throat was cut from ear to ear, but a skilful taxidermist could repair that, and what did it matter when I had got his horns after such a three days hunt.

NOTES ON THE SEASONAL OCCURRENCE OF RANGOON EARTHWORMS.

BY

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Casual study several years ago of collections of Rangoon earth worms seemed to show wide variations in the numbers of species to be found at different seasons of the year in this city. In order to obtain further information on this subject a record was kept of species, date of finding, and locality of all worms brought into the laboratory during the school year of 1923–1924. While these records confirmed the earlier ideas as to the seasonal occurrence they gave no information as to the relative rarity of the various species in the seasons in which they occur. Furthermore the collections were not made systematically so that the tabulation of the results left much to be desired in the way of completeness. In order to overcome these defects and to obtain additional information a slightly different procedure was adopted and put into practice during the last school year, (1924–1925). In the middle of every month one of the college *mahlis* was sent out each morning for several days in succession to dig for worms in widely separated regions of the town. The *mahli* was provided with a bicycle to enable him to cover the area in the time allotted and ordered to dig in as many different kinds of situations as could be found, such as sandy, loamy, clayey soil ; in gardens, ditches, bogs, compost heaps, garbage piles, rice fields, jungle, etc. The worms brought into the laboratory at the end of the day's work were sorted according to species and counted. At the end of the week the daily totals were added to secure a monthly grand total. These monthly totals are given below in Table B.

In the rainy months the earth worms were easily secured in almost any soil, although numerous attempts to obtain these worms from the clayey paddy fields, either before or after the water was drained off, were without success. At the close of the rainy season the soil slowly dried, in many places becoming very hard and cracked. As the season progressed the worms could, of course, only be found in places that remained wet due to some accident of location. The search was then confined to ground near tanks, lakes, and wells, to ditches, swamps, river banks, and soil that received drainage water from bathrooms and cookhouses, etc.

At first the collecting was directly supervised by the writer but limitations of time made it impossible to continue this direct supervision every month. It is therefore impossible to guarantee that all types of localities were visited every month. The tabulation of the results of the collecting seems to show however that the work was faithfully done. Thus *Perionyx excavatus* and *P. fulvus*, for instance, are usually not found with other worms but in soil rich in putrefying matter. The former was obtained every month and the latter in nine months. To secure these specimens visits must have been paid to the particular type of situation in which the species are usually found.

The geology of Rangoon.—The soil of Rangoon and immediate vicinity is mostly river alluvium—sands, clays, etc., with patches of old tertiary sands which have been partly changed into laterite. The weathered laterite forms reddish soil rich in iron. The altitude is roughly speaking a little above sea level.

The seasons.—The year may be divided into two seasons in Rangoon according to the rainfall ; the rainy reason (May to October) comprising roughly the months in which there are from ten to thirty rainy days and a fall of five or more inches of rain per month, and the dry season (November to April) in which there are usually less than five rainy days and a rainfall of much less than five inches per month. The dry season may be subdivided according to temperature. The months of November to February inclusive in which the mean temperature is usually below 80 are referred to locally as the cold season or cold weather. Similarly the period including the months of March, April, and May, in which the mean temperature is usually above 80 is referred to as the hot season.

In order to show as concisely as possible conditions in this city as to rainfall, rainy days, temperature and humidity, throughout the year, the results of meteorological observations made at the Imperial Observatory in Rangoon town have been secured from the monthly tables published in the Supplement to *The Burma Gazette*. These figures constitute Table A.

TABLE A

No.	—	1924								1925				
		May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
1	Actual rainfall in inches.	9·54	18·58	26·02	28·31	16·92	13·07	1·23	...	...	...	...	4·59	14·95
2	Normal rainfall in inches.	11·98	18·04	21·42	19·87	15·27	6·91	2·79	0·37	0·21	0·22	0·32	1·63	11·98
3	Actual number of rainy days.	15	23	27	27	19	15	5	...	...	...	...	A.	A.
4	Normal number of rainy days.	13·6	23	25·1	24·1	19·7	10	3·3	0·6	0·3	0·3	0·6	1·7	13·6
5	Mean relative humidity.	84%	89%	92%	93%	89%	87%	83%	80%	76%	83%	85%	82%	84%
6	Mean temperature.	85·2	81·5	79·9	80·6	82	82	81·6	76·2	76·9	78·8	83·7	83·6	84

A.—Information not obtainable.

TABLE B

Number.	—		—	1924								1925				
				May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
1	Drawida	longatria ...	E	+	2	...	2	...	..	1	...	16	177	85	X	22
2	,,	peguana ...	E	+	3	2	37	1	3	7	2	12	...	...	X	4
3	,,	rangoonensis	E	...	...	...	...	...	...	...	...	...	...	...	X	...
4	,,	rara	E	...	...	...	...	...	...	...	...	...	...	...	X	...
5	Megascolex	mauritii. (NR)	P	+	5	...	3	...	4	2	...	14	12	225	X	93
6	Pheretima	anomala ...	E (?)	...	2	4	28	17	25	3	4	...	...	...	X	...
7	,,	elongata. (NB)	P	...	11	...	...	...	...	4	...	...	...	...	X	...
8	,,	houlleti ...	P	+	3	14	38	22	18	49	3	...	7	2	X	...
9	,,	insolita ...	E	...	...	...	149	12	105	2	4	...	...	...	X	...
10	,,	lignicola ...	P	...	...	7	20	6	4	2	...	...	...	...	X	...
11	,,	peguana ...	P	I (?)	80	201	394	127	196	212	...	...	...	...	X	24
12	,,	planata ...	E	...	...	...	...	8	...	...	...	...	...	...	X	...
13	,,	posthuma. (NR)	P	+	11	8	58	18	113	55	15	51	37	47	X	34
14	Perionyx	excavatus ...	P	+	2	4	91	18	24	2	3	75	18	22	X	45
15	,,	fulvus. (NR)	P	+	3	14	4	3	1	3	...	...	2	4	X	6
16	Octochætus	birmanicus ...	E	+	14	7	98	9	63	29	40	228	439	187	X	4
17	Eutyphoeus	foveatus ..	E	...	140	169	260	22	54	...	...	...	...	...	X	189
18	,,	peguanus ...	E	...	...	4	27	12	44	2	...	...	...	...	X	...
19	,,	rarus ...	E	...	...	...	...	4	...	...	...	...	...	...	X	...
20	Pontoscolex	corethrurus. (NB)	P	+	3	11	82	3	2	24	14	130	134	153	X	8
21	Glyphidrilus	papillataus. (NR)	P	...	...	...	...	...	...	...	...	...	...	209	X	...

E.—endemic.
E ?—probably endemic. [See Gates (2).]
P.—peregrine.

+ worms of the species indicated secured but not counted.
. . . . worms of the species indicated not secured.
I ?—immature forms probably of the species indicated.

NR.—Not previously reported from Rangoon but reported from elsewhere in Burma.
NB.—not previously reported from Burma proper.

X.—No collections made. No collecting has yet been done in the vacation month of April. The normal amount of rainfall in this month is too small to bring out the hibernating forms and the ground around wells, etc., remains as moist as in March It is therefore probable that the same species occur in April as in March. At least those species which have been found to occur in both March and May will doubtless be found in April.

Discussion.—Study of Table B shows that the worms of Rangoon may be arranged into three groups according to their seasonal occurrence. In the first group are those forms which have been found only in the rainy season or which are practically limited to the rainy months, disappearing as the soil dries in November and December, not to be found again until the rains are under way in the next season. This group contains the following species :—

Pheretima anomala
,, *insolita*
,, *lignicola*
,, *peguana*
,, *planata*
Eutyphœus foveatus
,, *peguanus*
,, *rarus*.

Of this group of eight species, six are endemic in Burma, and the other two although peregrine are limited in their distribution. *P. lignicola* has not hitherto been reported outside of India and Burma. *P. peguana* is apparently confined to a region including Burma, Siam, and the islands to the south of the Malay Peninsula.

The second group contains those species which occur throughout the year or which have been found in both the rainy and dry months. The year-round species are :—

Pheretima posthuma
Perionyx excavatus
,, *fulvus*
Octochaetus birmanicus
Pontoscolex corethrurus.

Records of previous years together with the records for 1924-25 permit the inclusion of the following species in this section of the group :—

Drawida longatria
Megascolex mauritii
Pheretima houlleti.

The second section of this group is composed of the following species which have been found in both rainy and dry season months although not yet known to occur in every month of the year :—

Drawida peguana
Pheretima elongata.

The first of these two species have already been found in nine months of the year. *P. elongata* is very rare and only seventeen specimens have been found hitherto in Rangoon, eleven in June 1924, four in November 1924, and two in January 1923.

Of this second group only three species, *D. longatria*, *D. peguana*, and *O. birmanicus* are endemic. All the rest of this group with the possible exception of *Perionyx fulvus* are widely distributed.

The third group is composed of the following species which have been found up to the present time only in the dry season months and not in the rainy months :—

Drawida rangoonensis
,, *rara*.
Glyphidrilus papillatus

It should not be understood to mean that the forms of this group are considered to be limited in occurrence to the dry season, but only that they have not yet been found in any other season. The two species of *Drawida* are very rare in Rangoon. *D. rangoonensis* was found in November 1923, and in spite of repeated searches in the same and similar localities has not been obtained again. *D. rara* was described from six specimens obtained in November and December 1923. No further specimens have been secured. *G. papillatus* was found as the result of a chance search in still slightly moist soil at the bottom of a depression that had been covered with water for the previous ten months, during a great deal of which time the water was two feet or more deep. This species may be secured in Kalaw in March, April, and May, in Bhamo in March, in both places in soil that is slightly submerged, Possibly in similar situations in Rangoon these worms may be found all the year round. Collections have been made nearly every month in the ground near the depression mentioned above but without securing any specimens. It is hoped that further studies now in progress will furnish additional information regarding the occurrence of these three forms.

Variation from normal amount of rainfall as related to variation in occurrence of earthworms.—In the course of this study there have seemed to be several cases in which marked variations from the normal amount of rainfall have coincided with variations in the occurrence of certain earthworms. It has not been possible hitherto to check carefully these cases. The completion of the first year's work under the method described in the first paragraph of this paper has furnished a means for checking such variations. In order to show one such coincidence the month of May 1925 has been included in both tables to enable comparison with the same month of 1924. In May 1924 there was 9·54 inches of rainfall. In the same month of 1925 there was a rainfall of 14·95 inches, or nearly three inches more than normal. In May 1924 with nearly two and one half inches less than normal the only rainy season worms obtainable were probably immature specimens of *P. peguana*. In May 1925 with 5·41 more inches of rain than in the same month of the previous year *P. peguana*, and *E. foveatus*, both rainy season forms, were readily obtainable in numbers in exactly the same situations which had yielded the year before only year-round species and immature forms.

Apparently, then, a difference of a fairly small number of inches (when compared to the total amount of rainfall) especially at the beginning of the season may make quite a difference in the worms to be found at that time. This is rather strikingly illustrated by a collecting experience at Meiktila. This town is within the so-called dry belt of Burma and has a yearly average of 52·8 rainy days with only about thirty-three inches of rain. The first collection was made there on May 20, at which time there had been no rain for months. The ground was dry and hard and only a very few specimens were secured, most of which were found in an irrigated garden. The earth around wells and tanks, in which there is almost always a fair number of worms, even in the driest months, furnished at this place only two or three specimens. The worms obtained were *M. mauritii* and *P. posthuma*, both peregrine forms. There were light showers on the next day (May 21) and every day thereafter for several weeks there was more or less rain. On 24th no more worms were to be obtained than on the first day of collecting. The next few days were spent in collecting elsewhere. On returning to Meiktila on the 28th castings were found scattered everywhere and worms belonging to the genus *Eutyphoeus* were obtainable in large numbers. These were mostly immature and probably endemic.

The earthworms may disappear from a locality as quickly as they appear. While collecting in Insein one day in the middle of October, *P. anomala* was found in moist ground underneath a pile of paddy husks at the rear of a small mill. Returning several days later, not a worm was to be found although to all appearances the ground under the paddy husks was as damp as at the time of the first visit.

Seasonal variations.—Specimens of *D. longatria* and *O. birmanicus* vary in size according to the season, being much longer and thicker in the wet season than in the dry season. In the rainy months *O. birmanicus* may be found up to 117 mm. in length, and 6 mm. in width, while the same species in the winter months does not measure more than 65 mm. in length and 4 mm. in diameter. Similarly *D. longatria* secured the rainy weather may measure up to 153 mm. in length, and 6 mm. in width, while specimens of the same species do not measure in the cold months more than 90 mm. in length and 4 mm. in diameter.

Breeding season.—Cocoons have been secured in every month of the year but always from places where there are several species of worms so that it has been impossible to tell to which species they belong. When worms were separated according to species and kept in the laboratory cocoon formation nearly always ceased. The one exception to this statement was *P. corethrurus* which formed cocoons in great numbers; under laboratory conditions from December to March, inclusive. These worms were found in December forming cocoons in very dry, hard soil under the shade of a big tree, betwen three to six inches below the surface.

Notes on Distribution.—All worms obtained by digging have been obtained within a depth of two feet from the surface.

Eutyphœus foveatus is found in large numbers crawling over the ground after a storm. The numbers crawling around seem to be about the same after a driving rain as milder but longer continued downfall. Only one other species of the Rangoon worms has been observed to do this, *E. peguanus*. Worms secured in this way are not included in Table B, which enumerates only those obtained by digging.

Perionyx excavatus is found in large numbers in dung heaps, in soil saturated with water from bathrooms, cookhouses, or the kitchens of native houses, or soapy water in the dhobie compounds. *P. fulvus* is often found in association with *P. excavatus*, or in similar situations. In addition to specimens obtained by digging this worm has been found in a number of other situations such as ; under the bark of fallen trees, in cavities filled with humus and water in crotches of living trees, under epiphytic ferns, in the sheathing bases of plantain leaves, under detritus accumulated on roofs, in dirt filling the cracks between the floor boards of a second story verandah of a European house.

P. insolita, *D. longatria*, and to a lesser extent *M. mauritii* and *P. anomala* occur in limited localities. These ' pockets,' discovered by accident in some cases, were ' worked intensively ' to provide material for other investigations. Due to this the numbers of *P. anomala* and *P. insolita* are unusually high in August and October. In such pockets there is usually one predominant species. Others may be absent or, if present, in much smaller numbers. *P. insolita* and *P. anomala* generally are found together. *P. anomala* may be found without *P. insolita* but the latter has not yet been found in a situation where there are none of the former.

Where do the rainy season earthworms go during the dry weather? The only answer to this question would seem to be deeper down into the ground. Bourne records finding *D. grandis* in South India in May only at a depth of nine to ten feet. In hope of obtaining some information on this matter numerous visits were made to several areas where the Rangoon Development Trust was at work. Although the excavations were in some cases deeper than ten feet no information or specimens were secured. In this connection it may be of interest to report a conversation with an old Burman. He, as well as others, was interested in the sahib who was collecting worms and stopped to chat. In conversations which have arisen in this way the question above has frequently been asked, but usually without eliciting any answer except a statement that the worms are supposed to go deep into the soil. The old man just mentioned related that some years previous, in the course of digging a pit, he came upon, at a depth of about ten feet, a large mass of worms. He claimed that the worms were coiled up into a ball about six to ten inches in diameter.

Summary

The seasonal occurrence of twenty-one species of earthworms in Rangoon is recorded. The endemic species, with three exceptions are found only in the rainy season. The peregrine forms are found all the year round. Certain species have been found only in the dry season.

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BIRDS NESTING IN THE DRAS AND SURU VALLEYS

BY

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The tour I am about to describe was undertaken in the summer of 1925 with a view to study bird-life in the Dras and Suru Valleys. Dras and Suru are situated on the north-east side of the Great Himalayan Range and in order to reach this tract one has to cross the Himalayan barrier.

The Dras and Suru rivers take their rise in the Himalayan Range, draining the north-east slopes thereof. They unite just below Kargil and eventually flow into the Indus, half-way between Skardo and Leh.

The climate in these valleys is much drier than that experienced in Kashmir but less dry than in Ladakh proper. As in the latter, trees and field crops can only be grown on irrigated land, consequently the hill sides are generally almost bare of vegetation but even so they are greener than the hills in Ladakh.

The Dras and Suru rivers, rising in the snow fields and glaciers of the Himalaya, bring down huge volumes of snow water during the summer months, at which season they are quite unfordable. In late autumn the flow is greatly reduced and in winter they freeze down to about 10,000 ft. altitude and are then covered with snow. The villagers who inhabit this inhospitable tract are confined to their houses by snow for about 5 months, and it is necessary for them to store up fuel, food and fodder for themselves and their flocks and herds for the whole of this period.

In the summer, the time of my visit, the climate is a perfect one, bright sunny days, practically no rain, hot in the sun but cool in the shade. Full use is made of the many little snow-fed streams and an elaborate system of irrigation channels by means of which the fields get water in turn every few days, enables the inhabitants to raise magnificent crops of barley, lucerne and fodder grass, the latter full of lovely alpine flowers.

The only trees are willows—and poplars, planted on irrigated land, and sometimes wild in the rare places where swamps occur. Elsewhere in the vicinity of streams, we find wild roses, with deep red flowers, and a small extremely thorny shrub (*Lonicera spinosa*). Bird life in this tract is quite as conspicuous as in the valley of Kashmir but the number of species is much less.

I will now proceed to describe my tour in diary form.

June 21. Srinagar to Ganderbal. 13 miles.

My kit went by boat, rather a circuitous route, taking about 10 hours. I rode a bicycle, doing the distance in about 1½ hours. The road is nearly level all the way and passes through rice cultivation with a pretty view over the Anchar and Dal lakes.

The day temperature was fairly warm but the night quite cool. This is due to the proximity of the Sind river now full of snow water, the temperature of which at 6 a.m. was found to be 49° Faht.

June 22. Walked about 4 miles from Ganderbal to a piece of swampy ground near Krahom, which I knew to be a favourite haunt of the Chinese Paddy Field Warbler (*Acrocephalus concinens concinens*). This swamp is usually partially inundated but this year had been drained to some extent, so it was only moist under foot. The grass and rushes were about 2 to 3 feet high. The above warbler was almost the only bird seen in the swamp and they were fairly numerous. They flit about in the grass in pairs or small parties, occasionally disappearing into the grass. They are not very shy. The song of this bird is short but pleasant and with few harsh notes. We searched systematically through the grass (myself and two Indians) for about 3 hours and found 13 nests, including 10 with fresh eggs and 3 ready for eggs. 3 or 4 appears to be the normal full clutch. The nests were woven on to 3 or 4 grass or rush stems only a few inches above the ground and were not easy to spot, They were cup-shaped, fairly compact, and composed of dry grass and rush leaves and occasionally some moss neatly woven together with animal wool or vegetable cotton and lined with fine grass, moss fruiting stems, etc.

The eggs are nearly white or very pale greenish, with spots of sepia-brown and underlying markings of grey and neutral tint.

The average of 30 eggs is 17·0 by 12·7 millimetres.

The above species has previously been confounded with *Acrocephalus agricola*, and even in the Fauna of British India (Revised Edition) *A. concinens* is said to breed in Kashmir in rose bushes far from water, and *A. agricola* in swamps. As a matter of fact, *A. concinens* breeds in swamps throughout the valley of Kashmir and never away from water, whereas *A. agricola* does not breed or even occur in Kashmir at all.

June 23. Ganderbal (5,200 ft.) to Gaewan (6,400 ft.). 19 miles.

Our path led up the left bank of the river, my kit loaded on 7 ponies, going by the bridle path along the right bank.

On leaving Ganderbal a king crow's nest (*Dicrurus leucophæus stevensi*) was observed on a low branch of a chenar tree. It was just ready for eggs. On the march the following birds were noticed :—The Black Himalayan Bulbul (common), *Cryptolopha xanthoschista* (a few) the Rufous-tailed Flycatcher (several), Blue-headed Rock-Thrush *Petrophila cinclorhyncha* (a pair), Hodgson's Rose Finch, a pair, singing. Also *Cuculus canorus*, *poliocephalus* and *saturatus*.

A nest of the Kashmir Grey Tit, *P. m. kashmiriensis* was examined in a hole in a walnut tree, 5 feet from the ground. It contained 5 hard set eggs which were consequently not taken.

Arrived at camp under walnut trees close to spring. Beautiful view of snows up valley.

In evening found nest of Kashmir Roller *Coracias g. semenovi* in a hole in a hollow poplar tree, 50 feet from ground. The nest was far down in the hollow trunk and in-accessible.

Also a nest of the Indian Red-breasted Flycatcher (*Siphia parva hyperythra*) in a hole in a small Perrottia tree 5 feet from the ground. It contained only two partially incubated eggs.

Mosquitos a little troublesome in the forest, but by day time only.

June 24. A rainy, wet day. Searched for nests in forest, which consists here chiefly of a dense growth of Perrottia, a hazel-like large shrub or small tree, very valuable as fuel. The Red-breasted Flycatcher is common in this type of forest. I found two more nests of this bird in holes in Perrottia and Willow, 7 and 12 feet from the ground respectively. They each contained four rather hard set eggs.

A nest of the Dark-Grey Bush-Chat (*Oreicola f. ferrea*) was also found on the ground, at the foot of a wild Indigo bush, containing 4 fresh eggs.

June 25. Gaewan to Gaggangir (7,700 ft.). 12 miles.

The path still follows the Sind river, mostly on the right bank, the scenery getting finer and wilder and the hill sides more precipitous, as one progresses.

Shortly after leaving camp I saw a likely looking long, narrow, low island in the middle of the river to give access to which a pole had been thrown across from the mainland. This I crossed in fear and trembling, and got safely over. The island was then searched systematically for the common sandpiper (*Tringa hypoleuca*) whose eggs I had never taken.

The island was stony and sandy with a good many low bushes of tamarisk, indigofera, creepers, etc. My best expectations were more than fulfilled, as I put two sandpipers off their nests, well concealed in the low tamarisk scrub. The nests were mere hollows in the ground, lined with dead leaves and dry grass and contained 4 slightly incubated eggs in each. They average 35·5 by 26·0. Further on saw a Plumbeous Water Redstart building its nest in a hole in an old pollard willow, 6 feet above the water.

At Gaggangir I found *Hodgsonius phoenicuroides* and *Horornis pallidus* both common. The former is rarely found breeding as low as 8,000 ft. Also saw greenfinches and the Rufous-tailed Flycatcher Alseonax ruficaudus.

The Eastern Meadow Bunting *Emberiza cia stracheyi*, is also a common bird here. Its song is the best of all the buntings I know. It bears some resemblance to that of the Goldfinch, but is less prolonged.

June 26. Gaggangir to Sonamarg (9000′.) 7 miles.

The road now ascends more rapidly, between lofty rocky precipices, and the river assumes the character of a cascade or mountain torrent.

The Brown Dipper (*C. pallasii tenuirostris*) and Himalayan Whistling Thrush (*M. horsfieldi temmincki*) are common here, the former with fully-fledged young, the latter with nests against boulders often in midstream.

A nest of the Large Crowned Willow-Warbler (*Acanthopneuste o. occipitalis*) was found in a hole in a small tree overhanging the path, 7 ft. from the ground. It contained 2 pure white fresh eggs.

Sonamarg is one of the most beautiful spots in Kashmir. It consists of open grassy 'margs' or glades surrounded by steep slopes clothed with Silver Fir, Blue Pine, Yew and Birch forest, with steep snow-clad slopes and bare rocky precipices rising to 17,000 ft. on all sides, and with a glacier in the near distance.

June 27. Climbed up about 2,000 feet above camp—

Heard Monal pheasants calling. Watched a pair of Tytler's Willow-Warblers (*Phylloscopus tytleri*) but was unable to locate their nest. They build high up in Fir trees and consequently their nests are very difficult to find.

Found a nest of the Sooty Flycatcher (*Hemichelidon sibirica gulmargi*) on a lower branch of a big silver fir. The nest, a neat little mossy cup, compacted with spider's web, contained 3 much incubated eggs.

Other birds seen were the Grey-headed Thrush (*Turdus c. castaneus*), the Kashmir Wren (*Troglodytes t. neglectus*) the Red-flanked Bush Robin (*Ianthia rufilata*) Large Crowned Willow Warblers, Greenfinches and Goldfinches, all common.

In the grassy meadows below the forest Skylarks were numerous and evidently breeding, but no nests were found. A bird shot appears to be *Alauda gulgula guttata*, the same as the Ladakh Skylark.

June 28. Sonamarg to Baltal. (9,450 ft.). 9 miles.

The road still follows the valley, which is here much wider and the stream more gently flowing.

The nest of a Himalayan Tree Creeper (*Certhia h. himalayana*) was examined, under the bark of a fir tree. It contained three young and one addled egg.

Camped at Baltal, beyond the Rest House, in the shade of cherries, maples, silver fir and birch. Red-flanked Bush robins, Wrens, Tree creepers, Tytler's, Hume's and the Large-Crowned Willow-Warblers all common here. Found a nest of the latter in a rift in a fallen birch tree, one foot from the ground. Nest of moss, lined hair. It contained 4 fresh eggs.

June 29. Halt. Baltal. Found wren's nest in roots of fallen tree, containing 5 half-fledged young. Also nest of Brooke's Nuthatch *Sitta kashmiriensis* in a woodpecker's nest hole in a dead birch tree, 16 feet up.

The hole had been reduced in size by a ring of hard mud masonry. The nest contained 3 young birds.

My spaniel put up a pair of monal on a steep hillside above my camp. They were accompanied by 3 or 4 chicks only about as big as quail, but still able to fly well. A nest of the Kashmir Cinnamon Sparrow (*Passer rutilans debilis*) in a hole in a rotten Birch tree, 20 feet from the ground (an old woodpecker's nest) contained 5 hard set eggs.

Watched a pair of Orange Bulfinches (*P. aurantiaca*) but they did not appear to have a nest.

The White-capped Redstart (*Chaimarrornis leucoephala*) was common here.

June 30. Baltal to Matayan (10,600 ft.). 15 miles.

The ascent of about 2,000 feet to the Zojila Pass is steep for the first 2 miles, and then very gradual. Reached the pass in 2½ hours—There was not much snow, and the bridle path is good. Saw the Central Asian Blackbird (*Turdus merula maximus*) a little below the pass.

On crossing the pass the descent is very gradual and easy. Saw a good many Redstarts (*Phoenicurus ochrurus phoenicuroides*) Stoliczka's Mountain Finch (*Fringilauda nemoricola altaica*) the Yellow-headed Wagtail (*Motacilla citreola citreoloides*), the Ladakh Skylark (*Alauda gulgula guttata*) and a Raven or two (*C. corax tibetanus*).

Found a nest of the Skylark, with 4 fresh eggs, at 11,000 ft. Also a Common Sandpiper's (*Tringa hypoleuca*) nest on an island in the stream at the same altitude, with 4 freshly hatched young. Saw a good many Hodgsons' Rosefinch (*Carpodacus e. roseatus*) and the Gold-fronted Finch (*Metoponia pusilla*) near Matayan, but neither of these species is breeding yet.

Found several nests of (the Ladakh Chiffchaff) *Phylloscopus collybita* in the Tamarisk scrub by the river. Also several nests of the Yellow-headed Wagtail.

July 1. Matayan to Dras. (10,200 ft.). 14 miles.

A gentle descent along the broad valley of the Dras river, now a large unfordable stream, much swolen by snow water. Saw several Bluethroats, and captured a young bird, in mottled robin-like plumage with a rufous patch above the tail and no blue or red on the throat. Found several Chiffchaffs' nests with fresh eggs.

Saw Crag Martins (*Ptyonoprogne rupestris*), and House Martins (*Delichon urbica* subsp. ?) collecting mud for their nests.

Camped at Dras in an irrigated 'Bagh' under shade of willow trees. Goldfinches were numerous and singing—evidently about to breed. The Himalayan Goldfinch (*Carduelis c. caniceps*) breeds in May in Kashmir at from 5,000 ft. to 7,000 ft. and again in August at higher altitudes, about 10,000 to 11,000 ft., in Kashmir and Ladakh.

In evening crossed the river and searched long grass and scrub around cultivation on hillside. Put up a small bird at my feet in long grass and low briar. Searched carefully and discovered a rather deep nest of dry grass well concealed and almost on the ground in the grass and briar with 3 fresh eggs, pinkish white spotted all over, but most thickly at the broad end, with pinkish-claret markings. Secured parent bird after much patient waiting. She proved to be the Large-billed Bush Warbler (*Tribura major*). This was the first nest of this bird I had ever seen.

Subsequently a good many more nests of this species were found in the Suru Valley, all very well concealed, generally at the base of dense thorns (*Lonicera spinosa*) and buried in grass.

The call of this bird resembles the syllables chīpi . . . chīpi . . . chīpi . . . repeated *ad lib*—about 2 to the second. They are adept skulkers and the hen bird usually leaves the nest running rapidly through the grass like a rat, eventually taking flight at some distance from the nest.

The average measurement of 34 eggs is 18·9 by 14·3.

Another Skylark's nest with 4 fresh eggs was also found in a lucerne field.

July 3. Dras to Labar. (12,400 ft.). 10 miles.

Made a very early start, Cuckoos, Skylarks and Redstarts in full song. Climbed up a long ascent to the Lamagus La (Pass) at 13,700 ft. Snow at pass, but nowhere else.

On the ascent found the Long-billed Horned Lark (*Otocorys alpestris longirostris*) and a Short-toed Lark (*Calandrella acutirostris* subsp. ?) very common. Secured specimens of both but found no nests. The Asiatic Cuckoo (*Cuculus c. telephonus*) was also quite common; also Redstarts, but few other birds were seen.

Labar camp is in a broad flat valley at the junction of two big streams. The valley is full of a yellow-flowering onion, and marmots, the Red or long-tailed variety (*Arctomys caudatus*) are exceedingly numerous.

Stoliczka's Mountain Finch (*Fringilauda n. altaica*) and the Horned Lark were common here. No fuel available, except dry Yak and horse dung.

July 4. Labar to Umba. (11,000 ft.). 8 miles.

The temperature on rising at 4.30 a.m. was 31° Faht. and fording the stream under these circumstances was not pleasant!

The only new bird seen on this march was the Robin Accentor (*Prunella rubeculoides*) which was common at 13,000 ft. in the low willow and thorny scrub. Reached the Umba La (Pass) 14,400 ft. at 8 a.m. A glorious view of snowy mountains all round. From the Pass there is a long and very steep descent to Umba village at 11,000′. A few Yellow-billed Choughs, Eastern Meadow Buntings and Horned Larks were seen on the descent.

At Umba a Chiffchaff's nest in a low briar lined with willow down and black hair (no feathers) was found, containing 4 fresh eggs. The Bactrian Magpie was seen at Umba.

July 5. Umba to Sanku (9,970 ft.). 8 miles.

The path follows the Umba stream, almost unfordable at this time of the year. The valley contains a few willow trees, and a good deal of wild briar as well as the Ladakh Thorn (*Lonicera spinosa*).

Here the Gold-fronted Finch (*Metoponia pusilla*) and Hodgson's Rose-finch (*Carpodacus erythrinus roseatus*) were very common. Both red and white spotted Blue Throats were also seen, in the thorny scrub.

Several Gold-fronted Finch's nests were found in low briars, 2 or 3 feet from the ground, containing from 5 to 3 eggs, mostly fresh. The nest is composed of grass and weed stems, neatly lined with a dense layer of white willow cotton, and sometimes a little hair.

The Gold-fronted Finch is curiously local in these hills. They breed chiefly at an elevation of about 11,000 ft., and where they breed a good many nests may generally be found, but many other similar and apparently suitable places will be found unoccupied. They are very partial to the wild rose bushes as nesting sites, but they occasionally build also in dwarf willows and still more rarely on the face of steep rocks.

The eggs are white or skim-milk blue, spotted and sometimes streaked with pink or madder brown.

25 eggs average 17·9 by 12·8.

July 6–9. Halt. Sanku.

Sanku is a large village on an extensive flat above the Suru river, with much cultivation (barley, lucerne and fodder grass) intersected by irrigation channels, waste land between fields bring occupied by dense patches of the Ladakh Thorn.

There are also a good many willow trees.

Bird life was found to be exceeding rich in and around Sanku. The Kashmir Sparrow (*Passer domesticus parkini*) is by far the commonest bird.

Sky larks, the Eastern Meadow Bunting, Chiffchaffs, White Throats, Hodgson's Yellow-headed Wagtail, Blue Throats (chiefly the white-spotted variety), Hodgson's Rose Finch, Magpies and Large-billed Bush-Warblers are all common birds here. The Raven was also seen here, but is rare.

During my stay at Sanku nests of all the above species were found (with the exception of the raven). These included many nests of the Rose Finch and Yellow-headed Wagtail, and several nests of Redstarts, Blue Throats, White Throats and Large-billed Bush-Warblers. Also one nest with four fresh eggs of the Blue Rock-Thrush (*Monticola solitaria pandoo*). The eggs of this species are pale blue, sometimes spotless, not infrequently spotted with faint pinkish markings. Blue Throats were fairly common in the Ladakh thorn patches. The white spotted variety was decidedly the more numerous. A good many broods of young birds were seen out of the nest but several nests of the white spotted variety were found with 4 and 3 eggs.

The nests are built on the ground at the base of thorny bushes and are well concealed. They are if possible more difficult to locate than those of *Tribura major*. They are made of dry grass. The eggs are a dull, uniform sage green with or without pale reddish freckling, which sometimes almost obscures the ground colour.

The two varieties of Blue Throat (*Cyanosyloia suecica*) the red spotted and the white spotted, are found breeding together in Ladakh. They have identical habits and their nests and eggs are indistinguishable. It seems not improbable that they are only dimorphic forms of one and the same species.

The average measurement of 20 eggs is 19·1 by 14·3. Hume's Lesser White Throat which was also found fairly common in the Ladakh thorn scrub was also breeding. The nest is a flimsy, transparent structure of fine grass stems consolidated with spider's web or a little wool, and is placed in a briar or thorny bush 2 or 3 feet from the ground.

The eggs, three or four in number, are pale cream or almost white in ground, spotted with yellowish brown or dark sepia brown and with underlying grey markings.

They average 18·5 by 13·7.

July 10. Sanku to Hjook (10,550 ft.). 11 miles.

Camped close to river on a big grassy flat, opposite large islands covered with thorny scrub, tamarisk, etc. Blue Throats and *Tribura* were common here and nests of both were found on the Islands. The Ibis-bill (*Ibidorhynchus* *struthersi*) and the common Tern (*Sterna hirundo hirundo*) were also observed breeding here on inaccessible islands.

A Gold Finche's nest ready for eggs, in a small willow sapling, a Chiffchaff's nest and the nest of the Short-toed Lark with 3 fresh eggs were also found.

The Himalayan Turtle Dove (*Streptopelia orientalis meena*) was also noted.

July 11. Hjook to Suru. (10,600 ft.) 4 miles.

The view of Nunkun Mountain (23,400′) at the head of the valley and about 15 miles distant was most imposing. Found nests of *Tribura*, White-spotted Blue Throat, Chiffchaff and White Throat, all with fresh eggs.

July 12 to 16. Halt Suru.

The country round Suru is quite similar to that at Sanku, and the same birds were found common, with the addition of the Short-toed Lark (*Calandrella brachydactyla*) and the Long-billed Horned-Lark (*Otocorys a. longirostris*) a joint breeding colony of which was discovered about 1,000 feet above the camp.

The type of locality which these birds select for breeding purposes is a gentle mountain slope covered with scattered *Artemisia* and *Trollius* plants at from 11,000 to 13,000 ft. The nests of these two species resemble each other, being placed in slight depressions in the ground excavated by the parent bird and lined with a few blades of dry grass and a layer of fine, very soft vegetable down, partly, if not entirely, from the *Artemisia* plant. Nests are placed in the shelter of an often tiny *Artemisia* or *Trollius* plant.

Three is the full complement of eggs in both cases and not infrequently 2 only are laid.

The eggs of the Short-toed Lark are putty colour mottled all over with yellowish brown. They average 20·7 by 14·4.

The eggs of the Long-billed Horned-Lark are whitish, marked all over, and especially heavily at the broad end, with greyish brown or dark brown.

They average 24·5 by 17·4.

Eggs of the Ladakh Sky Lark, many of which were taken in the Dras and Suru valleys, resemble those of the Horned-Lark in colour but are decidedly smaller, averaging 22·9 by 13·3.

The Hobby was also seen at Suru.

Hodgson's Pied Wagtail (*Motacilla alba hodgsoni*) was also not uncommon by the river and two nests on the ground among stones were found.

July 17. Suru to Parkachik (11,500 ft.). 6 miles.

The river between Suru and Parkachik takes a very large bend. By the river the distance is nearly 14 miles but by a short cut over a pass it is reduced to 6.

The village Parkachik is perched on rocky prominences 500 feet above the river. There is, however, much fine cultivated land, with low bush cover and rocky precipices near by, an ideal place for birds.

Nests of the Crag Martin (*Pytnoprogne rupestris*) and of the European House Martin (*Delichon u. urbica*) the latter with eggs, were found under overhanging cliffs. Most nests of these birds were inaccessible without a ladder, an article which is quite unprocurable in a country where trees do not grow.

This (11,000 ft.) was the highest locality where *Tribura major* the Ibis-bill and the common Sandpiper were found breeding.

The Red-billed Chough (*Pyrrhocorax pyrrhocorax*) and Raven were both fairly common at Parkachik, where they doubtless breed on the cliffs in the early spring.

July 18. Parkachik to Gulma Tongas. (12,700 ft.) 12 miles.

The path, difficult in places, follows the river on the right bank. About half a mile above Parkachik the great Ganri glacier, taking its origin on the north-western slopes of Nunkun, terminates in the Suru River, which actually rushes past the snout of the glacier.

On the march several nests of Hodgson's Rose Finch (*Carpodacus e. roseatus*) and one of the White Throat (*Sylvia althea*) were found in a large patch of wild roses at 12,000 ft. This is about the upper limit for both these species.

The nest of this Rose Finch is made of dry grass, and is lined with fine roots, or with hair, or a mixture of both. The eggs are a beautiful blue, sometimes spotless, but more frequently marked at the broad end with spots or streaks of black or reddish brown. They average 20·8 by 14·9.

The male bird has a short but cheery song of 4 to 7 notes only, repeated at short intervals.

A Ruby Throat's nest (*Calliope pectoralis pectoralis*) was found on the march at the foot of a dwarf willow, containing a young fledged cuckoo. It was discovered by my spaniel and his barking led me to the spot where I found the young cuckoo defending itself from the dog in the way peculiar to young cuckoos—a regular little spitfire.

Shortly afterwards a Redstart (*P. ochrurus phœnicuroides*) was observed feeding another young cuckoo, well able to fly. How the cuckoo managed to deposit its egg in the nest of this redstart is a mystery, for the nest is placed in a small hole among stones. Many nests of this redstart were found in the Suru valley, generally under stones on steep hill sides or in stone walls. The nests are composed of grass and weed stems lined with hair and with often a few feathers. The eggs are generally 4 in number, very pale blue, sometimes almost white, mostly unspotted but occasionally faintly pink-spotted eggs are found. The eggs measure about 20·0 by 14·5.

At Gulma Tongas a few Green Sandpipers (*Tringa ochropus*) were seen by a small stretch of water. This is a very early date for the return of these birds from their breeding grounds in the far North.

The Western Red-breasted Rosefinch (*Pyrrhospiza punicea humii*) and Brandt's Mountain Finch (*Fringilauda brandti hæmatopyga*) were both seen near Gulma-Tongas. Both are birds of very high altitudes, being found from 12,000′ to 17,000′. The former is a large, handsome bird with a good deal of red on it. The latter is plain coloured, dark about the head with a pink tinge on the rump feathers.

July 19. Gulma Tongas to Zulido. 13,000′. 11 miles.

This march traverses a considerable area of swampy ground and marsh, with several species of dwarf willow forming thickets in places. This tract is known as Rungdum.

The Eastern Redshank (*Tringa totanus eurhinus*) was fairly numerous here, but from the behaviour of the birds they must have had young. Other birds common in and near the swamp were the Yellow-headed Wagtail (*Motacilla c. citreola*) Tickell's Willow-Warbler (*Phylloscopus affinis*) the Ladakh Chiffchaff, the Robin Accentor (*Prunella rubeculoides*) and the Himalayan Ruby Throat (*Calliope p. pectoralis*). Nests of all these species were found, with eggs or young, but systematic searching was difficult and painful owing to the clouds of mosquitos (a large *culex*) which attack one in incredible numbers, but only in the day time, both in and near the swamp area. Both the above species of *Phylloscopus* were observed catching mosquitos on the wing.

Common Terns (*Sterna h. hirudo*, were also seen near the river. As one approaches Zulido the valley alters in character and the whole expanse across the valley, which is here about ½ to ¾ mile wide, is a desert of stones and sand. Here the Lesser Central Asian Plover (*Charadrius mongolus albifrons*) was found to be fairly common. The area was exactly the type of locality which this species selects for breeding. No eggs were found but young birds were running about with their parents, some apparently only just hatched.

July 20. Zulido to Gulma Tongas.

On the return march saw many Blue Hill Pigeons (*Columba rupestris turkestanica*) and a few Snow Pigeon (*C. leuconota leuconota*) the former are common throughout the higher mountains in Ladakh. The latter keep to the higher slopes of the Himalaya. I fired into a flock of the former feeding in a field and killed 8 birds at one shot! They afford excellent eating.

July 21. Gulma Tongas to Parkachik.

Found two Gold-fronted Finchs' (*Metaponia pusilla*) nests, with 4 and 5 eggs respectively, at 12,500 ft. in dwarf willow trees 6 feet from the ground.

July 22. Parkachik to Suru.

Decided to follow the river, a long detour of about 14 miles. The first few miles was through good bird country, with plenty of rose bushes. Here I found a Rose Finch's nest with 5 hard set eggs, a very unusually large number. Half-way, at the bend of the river, it passes through an extraordinary narrow gorge, almost a cañyon, so narrow in places that one could jump across, with the river roaring down below. Boulders from the slopes above have fallen into this narrow defile and have bridged it in several places and my laden ponies crossed over without difficulty. Here I saw Whistling Thrushes White capped Red-starts and the Kestrel. The path from the gorge onwards traverses much rich cultivation and pasture land, full of wild flowers, and with the usual birds previously described.

July 23. Halt Suru.
Found nests of the Large-billed Bush Warbler *Tribura major* and Rose Finches with fresh eggs. Also a nest of the Eastern Meadow Bunting (*Emberiza cia stracheyi*). This bird is extremely common in Kashmir between 6,000 ft. and 12,000 ft.—occasionally even higher. They breed throughout their range in June and July. The nest is placed on the ground, concealed in grass or low herbage, generally on a steep bank ; it is composed of grass and lined with hair. Three eggs, never more, are laid which are dull white in ground, beautifully marked with fine chocolate or purplish brown streaks and lines, especially in a zone at the broad end.
They measure about 21·5 by 15·7.

July 24. Suru to Donara. (12,300′). 10 miles.
The path to Donara follows a tributary of the Suru River which at this time of the year is unfordable, except near Donara. The first 5 miles one passes through barren, uninteresting country. In the latter half of the journey more birds were seen, and on reaching Donara, where the valley opens out and where there are swamps and plenty of scrub willow, birds were seen in abundance, e.g., Kashmir White-breasted Dippers, Chiffchaffs, Tickell's Willow-Warblers, Yellow-headed Wagtails, Hodgson's Rose Finches, Ruby Throats, Martins, Hodgson's Pied Wagtail, Hodgson's Pipits and the Cuckoo—all breeding and the Cuckoo still calling.
About 1,000 ft. above the camp, at over 13,000 ft. I found the nest of Stoliczka's Mountain Finch (*Fringilauda nemoricola altaica*) a common bird on the Kashmir hills, but one whose eggs I had never previously found. The nest was in a hole under a big rock on the barren hill side, and it would not have been discovered had it not been betrayed by the sudden exit of the mother bird. A little earth excavation disclosed the nest, about 9 inches below the rock. It was composed of dry grass and weeds, lined with hair and contained four beautiful pure white eggs (pinkish before being blown). They measure (average) 20·9 by 15·4.
Mosquitos at Donara were if possible even worse than at Rungdum, a veritable plague by day, especially in the mornings and evenings until about an hour after sunset, when they all disappeared for the night.

July 25. Donara *via* Bhotkhol Pass to camp below glacier 11,500 ft. 10 miles.
Started at dawn and climbed steadily, at first over undulating rocky ground with dwarf willow in favourable places, and latterly over a glacier of semi-transparent ice, intersected by endless little parallel rivulets of water from the ice melting in the hot sun. Several Red-breasted Rose Finches (*Pyrrhospiza punicea*) were seen, apparently breeding on the steep rocky slopes, but I was unable to find any nests. The top of the Pass, 14,400 ft. was reached at 9 o'clock. A steep descent of some 800 feet brought us to a beautiful sunny spot covered by alpine flowers Edelweis, dwarf forget-me-nots, lark spur, purple asters, thyme, campanulas, etc. From this point the path follows the course of a great glacier, about 15 miles long which takes its rise on Nunkun Mountain. Progress was now slow, difficult and somewhat dangerous, owing to the fact that the surface of the glacier is intersected by cross, parallel crevasses, some narrow enough to be jumped but many too broad, and all very deep. In due course, however, they were all circumvented by my pack ponies. Then the route follows a rocky moraine, very difficult ground for ponies. This also was safely negotiated and we were all glad to reach our camp at the foot of the glacier at 4 o'clock after over 10 hours' hard going.

July 26. Halt Kanital (camp below Glacier).
A pleasant camp, with a spring of fresh water and plenty of fuel. The river as it leaves the snout of the glacier is a huge volume of dirty water, quite unfordable. There is a good deal of swampy ground near our camp with dwarf willow, etc. and plenty of birds but curiously enough, though the locality is similar in every way to Donara (on the other side of the pass) there are here absolutely no mosquitos. Birds common round this camp were the

Wren, Mountain Finches, Hodgson's Pipit (with young) Yellow-headed Wagtail, Redstart, Ruby Throat, Robin Accentor, Tickell's Willow-Warbler, Gold Finch, Hodgson's Pied Wagtail, Snow Pigeon and Griffon Vulture. At this camp two nests of the Himalayan Rubythroat were found, one containing two fresh eggs of this bird and one of the Asiatic Cuckoo (*Cuculus canorus telephonus*). The Rubythroat's eggs are greenish blue, faintly marked at the broad end with rufous. The cuckoo's egg is a rather deep spotless blue!

The other nest contained four fresh eggs.

Rubythroat's nests are made of dry grass and are *domed*, with a large latteral entrance. They are placed on the ground often under a stone on a steep bank or hillside, concealed in grass. The bird has a very fine song.

The eggs measure, on an average, 21·0 by 15·3. The cuckoo's egg measures, 25·4 by 19·5.

July 27. Kanital to Wan kadal. (9,950 ft.) 16 miles.

The path descends the big Wardwan Valley, a very gentle descent over grassy meadows and stony bed of river. A feature of the first few miles is the very big springs of water gushing out of the almost vertical limestone cliffs, several hundreds of feet above the valley, which give rise to picturesque water-falls. Two almost ice-cold streams had to be forded on the way. The usual birds were seen on the march, but no Bluethroats, Chiffchaffs, Gold-fronted Finches, Horned Larks or Short-toed Larks. A Missel Thrush (*Turdus v. bonapartei*), and some Jungle crows were seen at about 11,000 ft.

July 28, 29. Halt. Wan kadal.

The bridge over the Suru river having been washed away I was obliged to halt here, sending down to Suknes for men to rebuild it.

Climbed up to about 11,000 ft. and found a couple of pairs of the White-browed Rose Finches (*Propasser thura*) in the dense juniper scrub. This is a rather large, handsome bird, with no song but rather a harsh whistle repeated 6 to 8 times, not unlike the call of the White-cheeked Nuthatch (*Sitta l. leucopsis*). This bird is rather scarce in Kashmir being found sparingly in or near juniper scrub at from 11,000 to 12,000 ft. They appeared to be breeding but though I searched carefully here and on two or three subsequent occasions, I could find no nests. They undoubtedly build in the juniper. The nest of this bird has never, I believe, been taken. A pair of Himalayan Gold Finches (*Carduelis c. caniceps*) were observed building high up in a birch tree, at 11,000 ft. and a pair of Wrynecks (*Iynx torquilla japonica*) were feeding a brood of full grown young in a hole in another birch close by. This is a very high altitude for this bird.

Other birds seen near the camp were the Blue-fronted Red start (*Phœnicurus frontalis*) the Pink-browed Rose-finch (*Propasser rhodochrous*) Hodgson's Short-wing (*Hodgsonius p. phoenicuroides*) (with young able to fly) the Red-browed Finch (*Callacanthis burtoni*) the Red-flanked Bush-Robin (*Ianihia rufilata*) the Kashmir Wren (*Troglodytes t. neglectus*) Hume's Willow Warbler (*Phylloscopus humii*) and the Largecrowned Willow-Warbler (*Acanthopneuste o. occipitalis*).

July 30. Wan kadal to Suknes. (8,950 ft.) 6 miles.

This was a pouring wet day. Suknes is a big village, the highest in the Wardwan Valley, with extensive cultivation. Gold Finches were very common round the village but no new birds were seen, Tribura major was heard calling in the field crops.

July 31. Suknes to Rangmarg. (10,500 ft.) 13 miles.

Retraced our steps as far as the bridge at Wan kadal and then climbed up a big side 'Nala' and camped near a snow bridge, in an open valley devoid of trees, except a few birch.

Stoliczka's Mountain Finch (*Fringilauda n,. altaica*) and Skylarks were exceedingly numerous but no new birds were seen. A pair of red bears had just killed 10 sheep out of a flock, in one night, but having no rifle I could take no steps to avenge their death.

August 1. Rangmarg to Zojpal. (11,100 ft.) 9 miles.

A very steep ascent, barely practicable for laden ponies, a rise of 3,500 vertical feet in about 3 miles or less! The pass between the Wardwan and

Lidar Valleys was reached in about 5 hours. The elevation is 14,000′ and there was snow lying about. Thence a fairly steep descent brought us down to Vaojan near the beautiful Shisha Nag lake—elevation 11,600 ft. This lake, about a mile in length, is near the source of the Lidar River and about 9 miles below the sacred cave of Amarnath, to which an annual pilgrimage of thousands of Hindu 'Sadhus' takes place in August. I met the procession of pilgrims, on their way up. They were very inadequately clothed and the weather being extremely cold and wet they must have endured great hardships. I subsequently heard that some had died from exposure.

My camp at Zojpal was 2 or 3 miles below the Lake.

August 2. Halt Zojpal.

Very wet and cold. Fuel scarce and difficult to procure. Searched Juniper for nests of the White-browed Rose Finch. Saw several birds but no nests.

August 3. Zojpal to Tanin. (9,250 ft.) 5 miles.

A short steep march down the Lidar Valley the path being often high above the river. Tanin is at the junction of two big branches of the Lidar River. There is much forest on the hills around, consisting of Birch and Silver fir, Maples, etc.

Here it was considerably warmer, 54° Faht. against 47° at the last camp, and fuel was available galore. The Himalayan Turtle Dove was numerous and I shot several for the pot.

August 4–5. Halt Tanin.

Spent these two days searching the silver and birch forest for nests of the Orange Bulfinch (*Pyrrhula aurantiaca*). This is a very handsome Bulfinch fairly common in Kashmir, breeding in forest at from 9,000 to 11,000.

Several pairs were seen and one nest was found made of thin sticks and lined with fine roots on a horizontal branch of a small silver fir sapling. The nest was 4 feet from the ground and was sheltered by a second branch above it. The young had apparently just left the nest.

A nest of the Pink-browed Rose Finches (*Propasser rhodochrous*) was found in a similar situation to the Bulfinch's nest, at 10,000 ft. It was composed of fine sticks, birch bark paper, and fine weed and grass stems lined with hair and contained 5 fresh eggs, rather deep blue, sparingly spotted at the large end with black spots.

The eggs measure (average) 18·5 by 14·1 mm.

Aug. 6. Tanin to Astanmarg. (11,000 ft.) 6 miles.

A delightful camp in open birch forest under a lofty waterfall. Choughs, the red-billed variety, very numerous. Also Blue-fronted Redstarts and Rubythroats, Hodgson's Rosefinches, and the White and Pink-browed Rose finches were seen, the latter in the Juniper scrub but no nests were found.

Aug. 7. Halt. Astanmarg.

A further search was made for Rosefinch nests with no success.

Aug. 8. Astanmarg to Phraslun (8,000 ft.) 11 miles.

Camped at a charming spot under Blue pine trees on a grassy flat by the Lidar River which is here deep and slow-flowing.

Aug. 9. Halt Phraslun.

Searched the surrounding forest for Bulfinches with no success. Found nests of the Striated Laughing thrush (*Trochalopterum lineatum*) and Himalayan Turtle Dove with eggs. Shot a large red Flying Squirrel (*Pteromys inornatus*). Birds seen here were the Western Variegated Laughing Thrush (*Trochalopterum variegatum simile*) Ibis-bills, Hodgson's Pied and Grey Wagtails, the Brown Dipper, the Plumbeous Water Redstart, the Cinnamon Sparrow and the Himalayan Whistling Thrush.

Aug. 10. Phraslun to Pahlgam. (7,300 ft.) 5 miles.

Went down the left side of the river through fine forest of Silver fir, Spruce, Blue Pine, Yew, Maple, Walnut, Hazel and Perrottia. No new birds seen.

Aug. 11. Pahlgam to Aroo. (8,500 ft.) 7 miles.

A pleasant camp on grassy slope under Blue Pine trees, 500 feet above village.

Aug. 12. Aroo to Lidarwat. (9,000 ft.) 7 miles.

Heavy rain till 11 o'clock. Then it cleared and we marched with wet tents. The camp at Lidarwat is in an open grassy glade with lofty silver fir forest on both sides and the river 100 feet below.

Snow fell down to 11,000 ft. to-day which is extraordinary for the time of year.

Aug. 13 to 18. Halt Lidarwat.

Weather was very bad for the first 3 days, heavy rain, swollen streams and very cold.

Spent much time hunting for Bulfinches. Saw a few, including one young bird just out of the nest. This was in Silver fir forest at 9,000 ft.

Visited two pretty little lakes Tar Sar and Sona Sar at about 13,000 ft. One 7 and the other 8 miles from camp. Found nest of the Pink-browed Rosefinch (*P. rhodochrous*) in a thicket of dwarf willow at 11,000 ft. It contained 3 young and 2 eggs about to hatch. Other birds seen were Buzzards, at 13,000′ (probably *Buteo ferox*) the Central Asian Blackbird (*Planesticus maximus*) Scully's Owl (*Syrnium biddulphi*). This latter is common from 8,000 ft. up to the limit of tree growth at 11,000 ft. It replaces *Syrnium nivicola* of the Himalayas north of Simla and Mussoorie. Its call is quite distinct from that of the latter species, being a loud *Hoo*—followed after an interval of about five seconds by a rolling hoot. Hoo-oo-oo-oo.

Aug. 19. Lidarwat to Srinagar. 64 miles.

Marched down to Pahlgam and there got a seat in a car to Srinagar where I arrived at 2 o'clock. It was hot in Srinagar, but the coolness of autumn cannot now be long delayed.

Thus ended a very pleasant trip through interesting country and grand scenery. On the whole, I was satisfied with results, having taken three kinds of eggs new to my collection and many others more or less rare.

I was however disappointed in not getting the eggs of either the White-browed Rosefinch (*Propasser t. thurus*) or the Orange Bulfinch (*Pyrrhula aurantica*)—other ornithologists will doubtless follow and succeed where I have failed.

REPORT ON THE WORK OF THE BOMBAY NATURAL HISTORY SOCIETY AND OF THE PROGRESS OF THE NATURAL HISTORY SECTION, PRINCE OF WALES' MUSEUM

FOR THE PERIOD

APRIL 1, 1924 TO DECEMBER 31, 1925

Membership

The number of members on our rolls on January 31, 1926, was 1234 as compared with 1283 on the same date last year indicating a decrease in membership of 49. A personal appeal was made at the close of the year to all members to co-operate in increasing the membership and it is earnestly hoped that all members will respond by making a special effort during the present year to induce their friends to join.

Previous to the war the total number of members on our rolls was nearly 2,000—the losses occasioned by the war and the subsequent trade depression brought about a considerable falling off in membership. Throughout the difficult period the Society has endeavoured to maintain the same high standard in the publication of its Journal and has even increased its sphere of influence.

It should be recognized that since the withdrawal of the annual grant of Rs. 5,000 from Government the Society has become more dependent than ever on the subscription of members for its existence—An increased membership means increased resources and consequently extended opportunities for development.

Publications

The past year has been a record one in a bad sense since we issued only three Journals instead of the customary four and only two of these contained the usual coloured frontispiece. This is possibly one of the reasons for the falling off in membership during this period. We realize more than ever that to members residing outside Bombay the main advantage of membership lies in the regular receipt of the *Journal*. Our apologies are therefore due to all members for our inability to produce a fourth Journal within the requisite period. The cause was due to the change in our printers and the rather protracted negotiations that this step entailed. Now that the work is once again regularized we sincerely hope to produce the full complement of Journals during the current year.

Serials

Mr. Stuart Baker's Serial on the Game Birds of India was brought to a conclusion in Volume xxx, No. 2. On the representations of the Committee, Mr. Stuart Baker has very kindly consented to write a new series on Indian Wading Birds which will include the Storks, Cranes, Herons, Plovers, etc., these articles will be illustrated in colour and the illustrations are to be the work of Mr. Gronvold whose skill needs no recommendation from us—We take this opportunity of thanking Mr. Stuart Baker who in the midst of his arduous task of rewriting the volumes on birds in the Fauna of British India Series has found the time and the willingness to give the readers of the Journal the benefit of his great experience.

Among the serials of popular interest published during the period under review we would mention Col. A. E. Ward's interesting articles on the Game Animals of Kashmir, also Capt. Bates' charming Camera Studies and Notes on the Nesting Habits of Indian Birds ; Major Hingston's Studies of Insect Life, written in his customary lucid and captivating style ; Col. Evans' profusely illustrated papers on the Identification of Indian Butterflies, which will be invaluable to collector and student; Major F. C. Fraser's comprehensive serial on Indian Dragonflies and last but not least T. R. D. Bell's articles on the Common Butterflies of the Plains of India of which parts xxxiii, xxxiv and xxxv appeared during the year.

The concluding chapters of this serial have now been received from Mr. Bell and publication will be resumed in our next issue.

PUBLICATIONS.

Scientific Papers

The following contributions to Systematic Biology were published during the period under review :—

MAMMALS

Report on the Mammals of Nepal. T. B. Fry.

BIRDS

Birds of the Persian Gulf Islands. C. B. Ticehurst, M.A., M.R.C.S., M.B.O.U.

Note on the Birds of the Sikkim Himalayas. Parts V, VI and VII. H. Stevens, M.B.O.U.

Weavers and Finches of the Punjab. H. Whistler, F.Z.S., M.B.O.U., C.F.A.O.U.

REPTILES

Hand List of the Snakes of the Indian Empire. Col. F. Wall, I.M.S.
Note on Snakes collected in Burma. ,, ,,
Two New Burmese Snakes. ,, ,,

FISHES

Notes and Descriptions of Indian Fishes. Parts II and III. H. W. Fowler.

Early Stages in the Development of some Fresh Water Fishes in the Punjab. M. Hamid Khan, M.Sc., F.R.M.S.

INSECTS

Indian Dragonflies. Parts XX, XXI and XXII. Major F. C. Fraser, I.M.S., F.E.S.

Acrididae of Central Asia with descriptions of new species and races. B. P. Uvarov, F.E.S.

Heteromerous Coleoptera collected in Mesopotamia. K. G. Blair, B.Sc., F.E.S.

New Alpine Grasshoppers of the genus Conophyma. B. P. Uvarov, F.E.S.

Annotated List of the Thysanoptera known from India and Ceylon. T. V. Ramakrishna Iyer.

Two New Thysanoptera from South India. T. V. Ramakrishna Iyer.

PROTOZOA

Account of some Fresh Water Ciliates of the Punjab. Amar Nath Gulati, M.S.C.

BOTANY

Notes on Charophytes from Gonda, U. P. G. O. Allen, I.C.S.

ECONOMIC BIOLOGY

Notes on the Status of Parasitic Hymenoptera in South-India. T. V. Ramakrishna Iyer, B.A., F.Z.S.

An Undescribed Coccinellid Beetle of Economic Importance. T. V. Ramakrishna Iyer, B.A., F.Z.S.

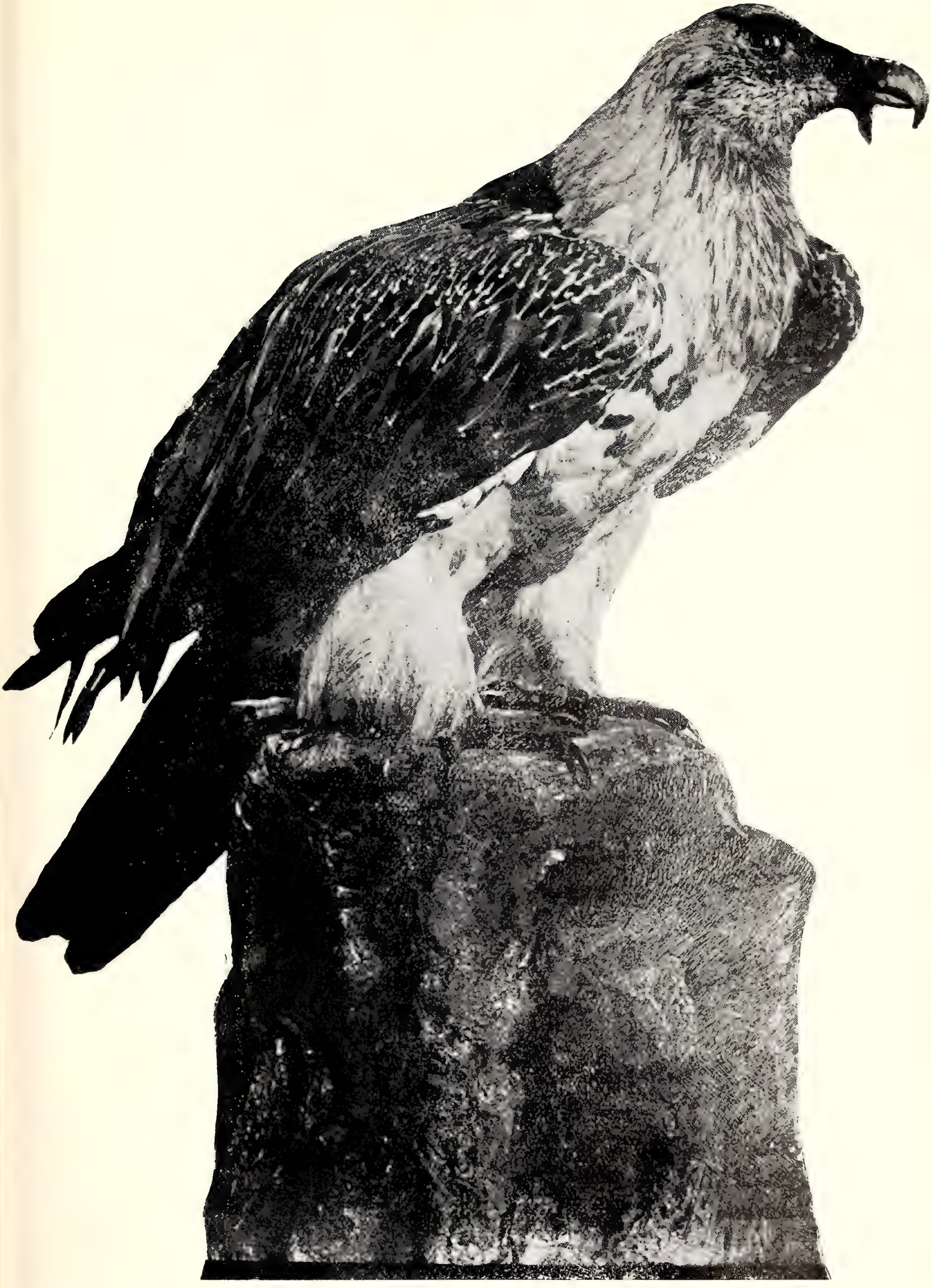
Mammals, Birds and Reptiles of Nepal

An account on the Mammals, Birds and Reptiles hitherto recorded from Nepal was prepared for the Government of Nepal by Mr. Prater, the Curator—as a consequence of the Society received a generous donation of Rs. 5,000 from H. H. The Maharaja to whom we would express our thanks.

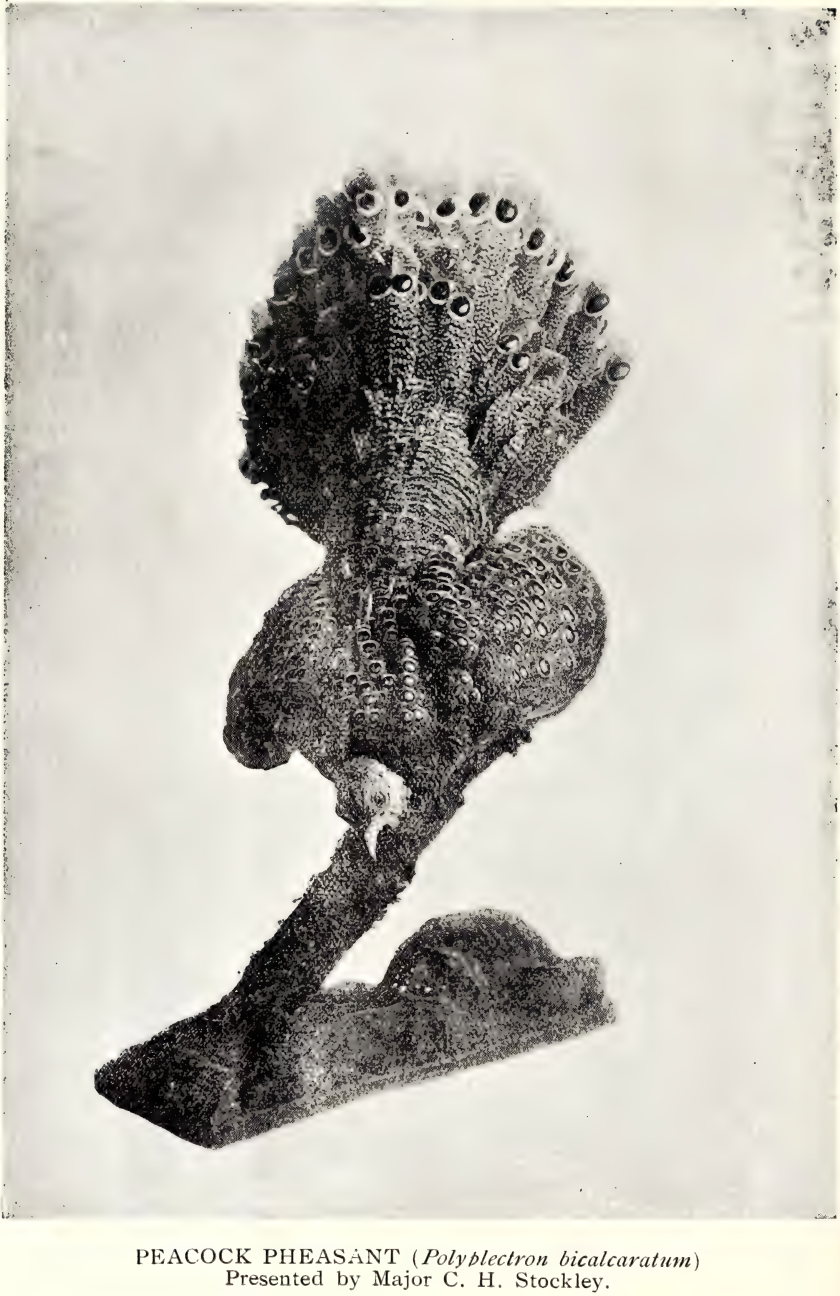
EXPLORATION

Mammal Survey

The vast amount of material obtained during the Society's Mammal Survey of India, Burma and Ceylon which includes nearly 20,000 specimens collected in various portions of the Indian Empire are now being worked out at the British Museum by Messrs. Martin Hinton and R. I. Pocock and the results of this work will appear in a new volume on Mammals in the Fauna of British India Series which has been sanctioned by the Secretary of State. On the completion of the work the specimens obtained by the Survey will be available for distribution among



LAMMERGEYER OR BEARDED VULTURE (*Gypaëtus barbatus*)
Presented by Mr. H. Whistler, I.P. and exhibited in the
Bird Gallery, Prince of Wales' Museum.



PEACOCK PHEASANT (*Polyplectron bicalcaratum*)
Presented by Major C. H. Stockley.

various Museums in India and abroad. Our reference collections of Mammals will benefit largely by the scheme and the question of the storage of this material is one that will have to be seriously considered in the near future.

Birds of Mesopotamia and the Persian Gulf

The Society's collector, Mr. V. S. LaPersonne, was employed by Sir Percy Cox and Major R. E. Cheesman in making a survey of the Birds of Iraq and the Islands of the Persian Gulf. The work was completed at the end of 1923—and the results are comprised in two papers by Dr. C. B. Ticehurst: The Birds of the Islands of the Persian Gulf—which appeared last year and Notes on the Avifauna of Iraq which appears in the present issue.

Collecting Expeditions

Two collecting expeditions were undertaken in 1924 for the purpose of supplementing the material in our reference collections, and obtaining material for mounting in the Museum. Mr. LaPersonne under the direction of Col. R. W. Burton made an eight months' tour in the Kumaon Hills whereby a large collection of properly prepared skins of Himalayan Birds were obtained in December 1924. Baptista accompanied Major C. H. Stockley on a collecting trip in Rajputana. The trip resulted in our obtaining a number of Game and Wading Birds for the Museum.

During 1925 the services of Mr. LaPersonne were placed at the disposal of Col. Meinertzhagen for the purpose of making a collection of Birds in Kashmir and Tibet and subsequently in Sikkim.

Baptista accompanied the Roosevelt Expedition during their stay in Nepal and the Central Provinces and his services were greatly appreciated.

POPULAR EDUCATION

Nature Study in Schools

As far back as October 1920, previous to the transfer of the Society's collection to the Prince of Wales' Museum, the Honorary Secretary submitted for the consideration of the Governor in Council certain proposals arising from the Report of the Society for the previous year. Our Committee considered that the Society might with considerable public advantage procure and have in the Museum the equipment required to illustrate the lines on which Nature Study should be taught in the schools and they therefore recommended to Government the appointment of a Committee to discuss the scope of the work which the Society might do in propagating information on the subject and the nature of the equipment requisite for the purpose. In a Resolution No. 254 dated 6th January, 1922, Government appointed a Nature Study Committee of which the Rev. Fr. Blatter, the Society's Representative, was elected Chairman. The Nature Study Committee completed its report in February 1923. It proposed that the Victoria and Albert Museum should be placed under the control of a Committee which would include representatives of Government and the Municipal Corporation and that, with the assistance of the Natural History Society, a collection of specimens suitable for exhibition to schools and the public should be maintained there.

Unfortunately the proposals put forward were unable to be given effect to and a more modified scheme was recommended, whereby it was suggested by the Society's Curator (who had studied the question of using Museums in connection with Nature Study during his deputation to Europe) that a room might be set aside in the Prince of Wales' Museum where Nature Study classes could be held under the guidance of a lecturer specially appointed for the purpose. These proposals were embodied in a covering letter from the Director of Public Instruction to Government, forwarding the report of the Nature Study Committee. In a resolution dated 8th December 1924 Government were pleased to approve of the proposals. The Secretary of the Society accordingly approached the Trustees as to the feasibility of their providing a room in the Prince of Wales' Museum where Nature Study classes for the local schools might be held and intimated that he had discussed with the Director of Public Instruction proposals whereby a competent man would be appointed on the Museum Staff to lecture and demonstrate to parties of children, both from the Secondary and Primary Schools in Bombay. As regards schools in the Moffusil it was suggested that students of the Secondary Training College should be given special instruction in the Museum by the Guide Lecturer, such instruction to be linked up with the special training they receive in the Training College—these men would act as a nucleus for introducing the subject in Secondary Training Schools throughout the Presidency. It was further recommended that a Permanent Nature Study Committee should be appointed for the purpose of drawing up a curriculum indicating the lines on which instruction should be given at the Museum and the subject matter of the lectures.

At their meeting on December 22, 1925, the Trustees of the Prince of Wales' Museum sanctioned the use of a part or the whole of the N. W. Mezanine front verandah gallery for the above purpose. The necessary space having been made available, a suitable candidate for the post of lecturer was selected, on the recommendation of Rev. Fr. Blatter, and it was confidently hoped that the scheme could be given effect to at the beginning of April 1926. The question of funds however provided the usual stumbling block. It was estimated that an initial expenditure of not less than Rs. 1,500 and a recurring annual expenditure of Rs. 4,000, rising in six years to Rs. 6,000, would be requisite for giving effect to the scheme. The Department of Public Instruction are unable in the present year to provide any money towards the cost of the scheme and there is a danger of the proposals falling through for the present owing to the want of money, unless a sufficiently public-spirited citizen of Bombay can be found to contribute a sum of Rs. 5,000 to tide us over the present difficulty.

Preparation of Charts, etc.

One of the drawbacks to the teaching of Nature Study in schools in India is the lack of suitable literature dealing with animal and plant life of this country ; as a step towards supplying this deficiency it is proposed to prepare a series of Natural History Wall Charts for the use of schools. Preliminary work is now being undertaken in the preparation of six charts illustrating the Common Birds of the Indian Plains, with particular reference to the species occurring in the Bombay Presidency. It is proposed to illustrate in colour about 150 species of Common Birds. An introductory chart illustrating the main characters of the various families of birds will be issued with the set, together with an explanatory pamphlet to serve as a guide to the teacher. The letter press will be printed in English and also in Marathi and Gujarati.

Lantern Slides.

A series of Lantern Slides illustrating the common Indian Reptiles were prepared during the year. The preparation of similar series dealing with various forms of animals and plants, which will eventually be available for use in schools, is being undertaken. It is to be remembered, however, that these slides would be of little use if exhibited by teachers not possessing a practical knowledge of the subject. It would seem that these slides should ordinarily only be sent to schools where there was a teacher who has received special training in Nature Study during his term at the Secondary Training College—such training to include special reference to the subject-matter of the lantern slides.

Co-operation with Education Department

The policy behind these proposals is that the Natural History Section of the Prince of Wales' Museum, with which the Society is so intimately associated, should take a larger and more active share in the educational life of the City. The Educational work of the Society presents two phases, namely the dissemination of knowledge through the pages of its Journal and its other publications and the general education resulting from the influence of the exhibits in the Museum galleries through which channel the Society contributes to the education of the community and the country—a sphere of influence which might be infinitely widened by bringing the Museum in contact with schools and other agencies for the introduction of youth. This contact can best be achieved through the Department of Public Instruction which should form a means of connecting the Museum with the Educational system of the country. Through the Education Department the Museum comes in direct contact not only with elementary and high schools, but also with private schools, colleges and the Universities, and the proposals put forward in this report, if given effect to, by establishing a closer co-operation with the Educational Department will enable the Museum to take a more active share in the Educational life of the Presidency and will bring the Museum more abreast with the work that is being done in this respect by kindred institutions abroad and will be entirely in keeping with the main objective for which our Museum exists.

One of the results of the close contact the Society maintains with the public and the Press is the number of calls that are made upon us by various

Government Departments the public and the press for information pertaining to every phase of Natural History.

Assistance, Public and Institutions

Assistance was rendered during the year to schools and colleges by the loan of specimens for teaching purposes. Help was given to a large number of hospitals and dispensaries by the identification of snakes and harmful parasites. To the Agricultural Department by supplying information in regard to the identification of the rodent pests of crops in Sind—incidently information is now being obtained as to the possible commercial value to the pelts of some of the larger species—to the Army Clothing Department by the recommendation of measures for the protection of stored woollen garments ; to the Forest Department, Burma, by the supply of 300 copies of a chart specially issued by the Society for the identification of the skins and skulls of Wild Dogs presented for purposes of reward ; to the Great Indian Peninsula Railway by the indentification of Ticks infesting Tezpur Railway Station, which were responsible for an outbreak of fever, and the recommendation of preventive measures ; to the Government of India by the supply of information and advice on the subject of Egret Farming in Sind and the proposed amendment of the Plumage Bill ; and finally to the Public and the Press by answering numerous queries through correspondence on Natural History.

Library

A large number of books and Natural History Journals and publications were added to the Library during the year—received either through exchange or purchase. We must specially mention the munificent gift of Mr. F. V. Evans who besides presenting us with 157 volumes dealing mainly with Western India—many of them rare and of great value ; gave a number of valuable prints of old Bombay which are now on exhibition in the Prince of Wales' Museum. He further enriched our Library by presenting us with a very perfect set of Gould's Birds of Asia in the original binding.

LECTURES

The following lectures were delivered in the Museum to the members of the Natural History Society and their friends :—

'Indian Reptiles, their Habits and their Haunts,' by S. H. Prater, C.M.Z S.

'Animal Life in the Desert', by S. H. Prater, C.M.Z.S.

'The Hamadryad or King Cobra', by Col. F. Wall, I.M.S., C.M.G., C.M.Z.S.

'A Rough and Tumble with an African Buffalo', by Major C. R. S. Pitman, M.C.

In addition to the above, the Curator also delivered lectures at the Secondary Training College, Nature Study Club, the Y.M.C.A. and the Sassoon Mechanic Institute.

NATURAL HISTORY SECTION, PRINCE OF WALES' MUSEUM

Government Grant

The maintenance and operations of the Natural History Section for the fiscal year from April 1, 1924 to March 31, 1925, were provided for from the grant of Rs. 20,500 received from the Government of Bombay.

The opening balance at the Bank on April 1, 1924, amounted to Rs. 320-2-6. The income during the year from interest on investments and other Miscellaneous receipts amounted to Rs. 851-2-9.

In accordance with the terms of agreement existing between the Natural History Society and the Board of Trustees, Prince of Wales' Museum, a contribution of Rs. 5,550 was made by the Society, being half the cost of the salaries of the Curator and Assistant Curator.

Income and Expenditure

The total income of the Natural History Section for the period under review, including the donation received from His Highness the Maharao of Cutch amounted to Rs. 26,351-2-9.

The disbursements may be classed as follows :—Establishment, including Board's contribution to the Provident Fund, Rs. 13,091-3-2 ; Taxidermy Department Rs. 1,712-8-3 ; Show cases and equipment, Rs. 1,790 ; Miscellaneous charges, Rs. 1,315-5-6 ; making a total expenditure of

Rs. 17,909-5-11. The closing credit balance on March 31, 1925, amounted to Rs. 8,761-15-4. The balance will be largely taken up by the expenditure on the Show cases which were ordered but had not been paid for at the close of the year.

Taxidermy Department

As in the previous year, the work of the Taxidermy Department represents a considerable saving in expenditure. Among the animals set up is a complete bull Bison which was mounted in the Society's Laboratories at a cost of Rs. 400. According to estimates received the cost of setting up the same animal elsewhere would have amounted to well over Rs. 1,000, exclusive of freight and packing. We publish in this report a photograph of the Bison being let down from the 1st floor windows of the Laboratory into the street below. It will indicate some of the difficuities with which the department has to contend in carrying out its work.

Need for suitable Laboratory

There is no suitable Laboratory attached to the Museum and the work of the Taxidermist Department is carried on at the Society's rooms in 6, Apollo Street. The rooms are quite unsuitable both as regards lighting and accommodation, while the transport of large exhibits from this location to the Museum involves considerable labour and expenditure. A suitable laboratory in the grounds of the Museum is urgently needed, but here again the question is purely one of funds.

Show Cases

A donation of Rs. 5,000 from H. H. The Maharao of Cutch has enabled us to place orders for the construction of twenty-four desk cases for the Invertebrate Section, but for H. H.'s generosity the provision of show cases for this purpose could not, for the present, have been undertaken.

Show cases for the Reptile and Fish Galleries are still required and the absence of adequate facilities for the exhibition of material still continues to impede the development and progress of these sections of the Museum.

As previously indicated the grant hitherto received from Government, beyond covering the cost of maintenance of the Natural History Section, leaves very little provision for the purchase of equipment, etc., and the Section continues to be dependent mainly on extraneous assistance for its development.

MAMMAL GALLERY

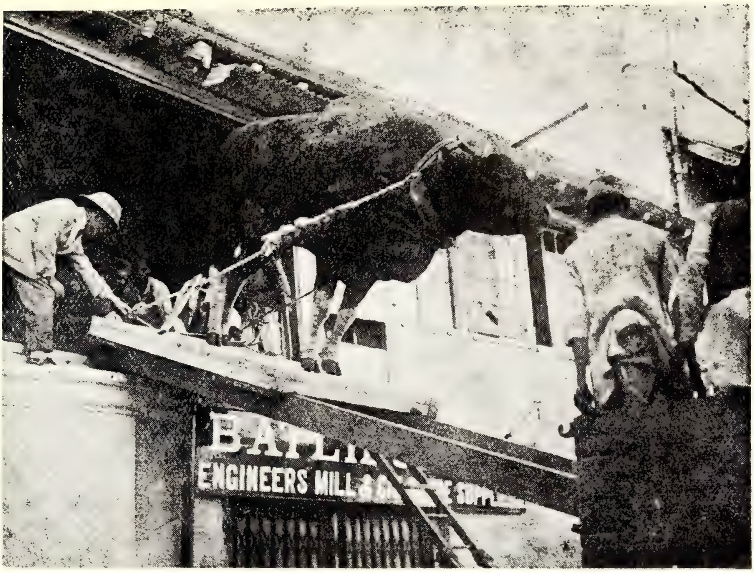
The year has been a busy one and very considerable progress has been made in this section of the Museum.

GROUP CASES

A notable addition to the Gallery is the new group case illustrating Animal and Plant life in the Indian Desert Region. The case was planned with a view to illustrating the conditions under which desert animals and plants live and the manner in which they respond to the influence of their peculiar environment.

Mr. C. McCann, Assistant Curator, was sent on an expedition to the Sind Desert in June, 1924, where he made a collection of desert plants and animals and collected other accessories such as sand, stones, etc. A series of photos of a particular portion of desert country was also taken and with the material thus obtained a careful reconstruction of the selected spot was made.

The difficulty of giving a correct impression in a limited space of an extensive desert landscape with its distant horizon can be easily imagined, particularly when the effect is to be produced with a horizontal built-up fore ground and a painted back ground, but with patience and repeated experiment the technical difficulties were overcome and the correct perspective and continuity maintained. Our artist, Mr. Savardekar, in his treatment of the back ground has succeeded in giving a graphic impression of the desert landscape. The accompanying photograph gives an idea of the group as it stands. Arrangements are now in hand for the production of a second group case illustrating life in rain-sodden forest country. The venue selected is a forest-covered range in the Anamallai Hills, South India. Mr. Savardekar was sent in September last year to Palghat where he worked for three months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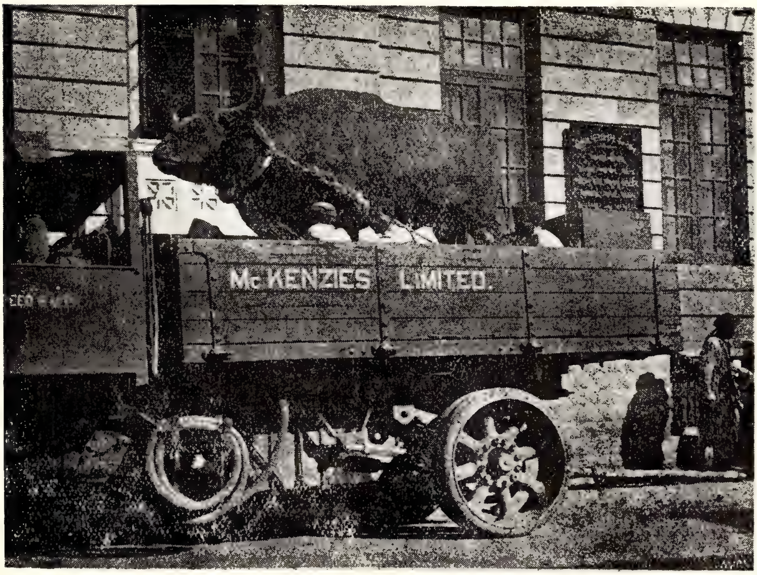

McKENZIES LIMITED.

THE PHOTOGRAPHS SHOW THE INDIAN BISON, MOUNTED IN THE SOCIETY'S LABORATORY, BEING LET DOWN FROM THE FIRST FLOOR WINDOWS AND *en route* TO THE MUSEUM

Desert Country at Golamala, Karachi district, Sind
A portion of the group exhibited in the Prince of Wales' Museum.

under the supervision of Mr. A. M. Kinloch. Studies in oil and water colours were made and a series of photographs taken of forest views. In addition a large number of plaster moulds were prepared of the foliage flowers and fruits of the trees and shrubs which will eventually be reproduced in wax within the case.—Our thanks are due to Mr. Kinloch for the help he has given us in this connection.

Notable Acquisitions

A further notable acquisition is the complete example of an Indian Bison which was placed on exhibition in January 1925. The animal was obtained through the Forest Department and was shot in the Kanara Forests in May 1924 by Mr. J. L. Bell. It is a splendid black bull standing five feet eight inches at the shoulder. The animal was mounted in the Museum Laboratory by Mr. C. McCann and has been very favourably commented upon by various big game hunters with first-hand experience of Gaur in the wild state.

Other additions to the Gallery are a pair of Punjab Oorial (*Ovis vignei punjabiensis*) shot in the Salt Range, Punjab and presented by Major C. H. Stockley and Col. R. W. Burton. A male and female example of the species are shown in the group which was completed and placed on exhibition in May 1924.

In 1925 very perfect examples of the Kashmir Stag and the Swamp Deer were added to the galleries, both of them presented by Col. R. W. Burton.

Labelling

Explanatory labels showing in simple language the main characters of the various orders, families and sub-families of mammals were prepared and placed in the Gallery during the year.

A series of small maps showing the geographical distribution of the various exhibits was also added. These maps enable the visitor to tell at a glance the habitat and range of the animal at which he is looking.

A series of explanatory labels in Marathi were introduced during the year. These vernacular labels are confined, at present, to a general description of orders and families—our thanks are due to Professor Hate of Wilson College for the assistance given us in the preparation of these labels.

Accessions

A large number of contributions to the collections were received during the year. Among these are two complete skins of the Mishmi Takin (*Budorcas taxicolor*) presented by Messrs. J. P. Mills and H. L. Cooper. This rare animal is seldom represented in Museum collections and the complete skins received form a very welcome acquisition. A very handsome skin of the very rare Wooly Flying Squirrel of Gilgit (*Eupetaurus cinereus*) was presented by Lt.-Col. D. C. R. Lorimer. Two very fine trophies were added to our collection of heads of Indian Big Game. These represent the record head of the Himalayan Grey Goral (*Nemorhaedus goral*) with horns measuring 9½ inches presented by Mr. H. Simmonds, who shot the animal some years ago in the neighbourhood of Mussoorie, and a magnificent head of the Nilgiri Tahr (*H. hylocrius*) with horns measuring 16½ by 9½ inches presented by Capt. R. H. Irvine.

Reference Collections

The vast amount of material obtained during the Mammal Survey of India, Burma and Ceylon is now being worked out at the British Museum where Messrs. M. A. C. Hinton and R. I. Pocock are engaged in the preparation of a new edition of the *Mammalia of India*. On the completion of the work the specimens obtained by the Survey will be available for distribution among various Museums in India and abroad. Our reference collection of Mammals will benefit largely by this scheme and the question of the storage of this material is one which will have to be seriously considered in the near future.

BIRD GALLERY

Considerable progress has been made in the mounting and preparation of exhibits for the Gallery—98 specimens were mounted and placed on exhibition in the Gallery during the year 1925.

Collecting Expedition

Two collecting expeditions were undertaken for the purpose of obtaining material for the Gallery. The Society placed at the disposal of the Museum the services of its collector, Mr. V. S. LaPersonne, who, under the direction of Col. R. W. Burton, made an eight months' tour in the Kumaon Hills whereby a large collection of properly prepared Himalayan Birds was made available to the Museum—a number of these specimens have already been mounted and placed on exhibition in the Gallery.

In December 1924 Mr. N. A. Baptista accompanied Major C. H. Stockley on a collecting trip in Rajputana. The trip resulted in our obtaining a number of Game and Wading Birds for the Museum.

Nesting Groups

The Curator is endeavouring to prepare a series of group cases illustrating the nesting habits of Indian Birds. During the year the first of this series was completed and illustrates the nesting habits of the night herons (See plate). Through the kindness of Mr. J. M. Doctor, the Superintendent of Victoria Gardens, examples of the nests, young in down plumage, fledglings and adult night herons were obtained for us. The group as shown is a careful reproduction of the nesting site of these birds. The young in down plumage are shown in the nest with the parent birds in attendance and a fledgling bird is seen in the background. The natural modelling of the leaves and the grouping of birds makes very pleasing and attractive exhibit. An illustrated label which contain a series of photos showing the Life History of these herons is used in connection with the case.

During the year a number of nests of Indian Birds were obtained for us by Mr. C. E. D. Mears—this series included very carefully preserved examples of nests of the Minivet, Flower Pecker, Tailor Bird, Iora and Weaver Bird.

Mr. M. S. Tuggerse is now endeavouring to obtain for us a nest of the Great Indian Hornbill, and we hope shortly to commence work on a group illustrating the nesting habits of this species.

Accession

Other notable additions to the Gallery during the year are the Peacock Pheasant (*P. bicalcaratum*), presented byMajor C. H. Stockley, and the fine example of Mrs. Hume's Pheasant (*P. humiae*) presented by Mr. J. P. Mills. These two additions have helped to complete our exhibit of Indian Pheasants which now shows the principal species inhabiting the Indian Empire.

Other notable additions are a fine example of the Lammergeyer presented by Mr. H. Whistler, and Sarus Crane and White Stork presented by Major C. H. Stockley.

Considerable headway remains to be made and a large number of blanks remain to be filled up in the various families and genera of Birds. These lacunae prevent our following a strictly systematic order in the arrangement of the exhibits.

Reference Collection

A very large number of donations were received during the year 1925. Among these contributions one which deserves special mention is an example of Pallas' Sandgrouse (*Syrrhaptes paradoxurus*) which was shot in Bikanir and presented to the Society by H. H. The Maharaja of Bikanir—Pallas' Sandgrouse inhabits the steppes of Southern Russia and Siberia and large flocks of these birds visit Europe at uncertain intervals, but this is the first record of their occurrence within Indian limits. Two other interesting donations were examples of the Scaup Duck (*F. marila*) obtained in Bengal and Manipur and presented by Mr. Monahan, I.C.S., and Mr. J. C. Higgins, I.C.C., respectively. The Scaup is a bird of extremely Northern Latitudes and its occurrence in India is rare and occasional.

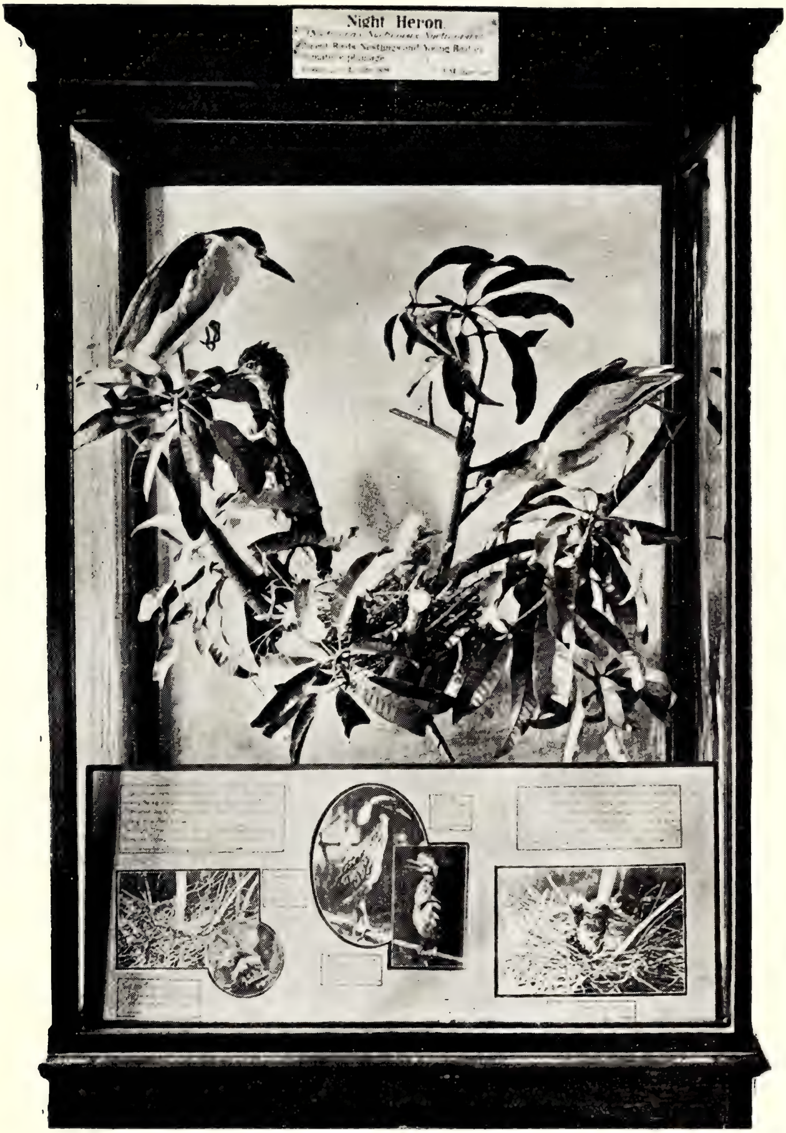
REPTILES AND AMPHIBIANS

Show Cases

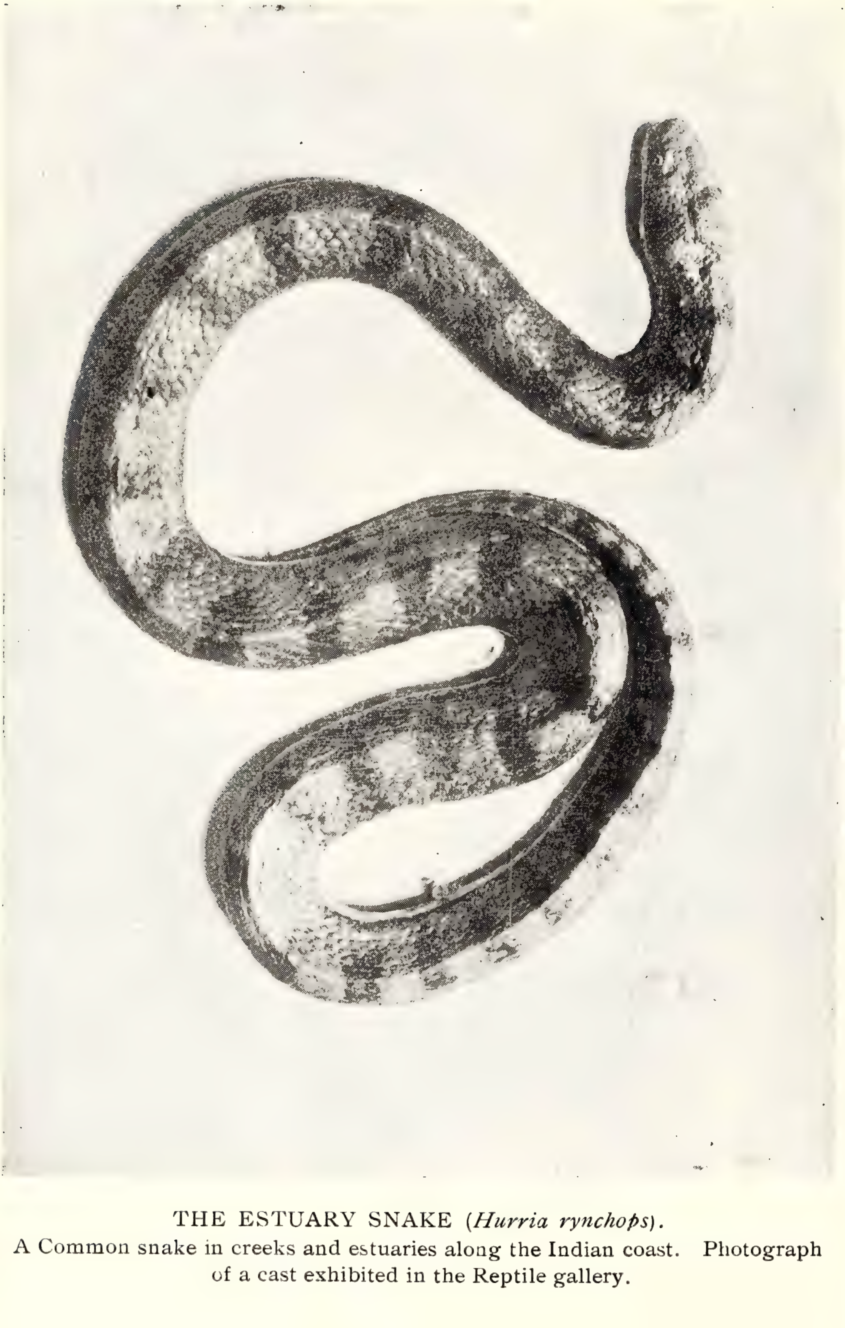
The lack of suitable show cases still continues to impede the development of this department of this Museum. Progress has however been made with the preparation of casts of specimens for eventual exhibition in the Gallery.

Casts

Eight casts of Common Indian Snakes were prepared during the year 1924. In this connection we must particularly mention the services of Major K. G. Gharpurey, who at his own expense, employed a collector to obtain live specimens for the Museum. The preparation of casts from specimens which have been preserved in spirit or formalin is unsatisfactory. The best results are obtainable from fresh material which has also the added advantage of permitting notes on colouration, characteristic poses, etc., to be taken previous to casting.



Nesting group of Night Herons (*Nycticorax nycticorax*)
Exhibited in the Bird Gallery, Prince of Wales' Museum.



THE ESTUARY SNAKE (*Hurria rynchops*).
A Common snake in creeks and estuaries along the Indian coast. Photograph of a cast exhibited in the Reptile gallery.

Major Gharpurey's assistance has been of great value. Attempts are now being made to obtain live specimens of reptiles from various parts of India so as to make our exhibit of reptiles as representative as possible.

During 1925, 16 live snakes from Darjeeling were presented by Mr. G. E. Shaw. Casts have been made from the specimens which will shortly be available for exhibition in the Gallery.

Publication

The Curator's pamphlet on the Snakes of Bombay and Salsette, originally printed in the Journal of the Society was reprinted and placed on sale in the Museum by order of the Trustees. The first edition having been sold a second edition is now being printed.

FISHES

Casts

Eight casts of common Bombay fishes were prepared during the year. The obtaining of material for making casts of the commoner fishes of our local waters presents no difficulty as specimens are continually being brought in by local fishermen. Among the specimens purchased in this manner during the year is a fine example of the Sword Fish which is now being prepared for exhibition. A shark 18 feet long was also brought to our doors late one evening, but as its continued presence in our neighbourhood might have resulted in unpleasantness with our neighbours and the Health Department the prize was reluctantly refused. But this will indicate that the acquisition by the Museum of a fine series of casts of our common fish is, in the main, a question of the time taken in preparing these exhibits—but until sufficient funds are available for providing suitable show cases for exhibiting these casts our plans for the development of this section must remain in abeyance.

Reference Collection

The spirit collections of fish was attended to during the period under review and a large collection of fish, obtained during the recent trawler operations in Bombay, was forwarded to Mr. H. W. Fowler of the Academy of Natural Sciences of Philadelphia for identification. These specimens when named and returned will form a valuable asset to the reference collection.

INVERTEBRATE GALLERY

Lack of Accommodation

For want of suitable accommodation the Invertebrate Collections up to the date of this Annual Meeting continued to be exhibited in the Bird Gallery. During 1925 negotiations were entered into with the Chairman of the Board of Trustees, Prince of Wales' Museum, whereby it was proposed, pending the sanction of the Trustees, that the Circular Gallery on the Mezanine Floor now in occupation partly by the Forest Section and partly by the Archæological Section should be handed over to the Natural History Section in exchange for the Verandah Gallery which is entirely unsuitable for exhibition purposes.

The lighting of the Circular Gallery, particularly during the monsoon, is very defective but it was suggested that a system of semi-indirect artificial lighting would go far towards improving matters. Apart from this, the protected situation of the gallery makes it an ideal one for the display of insects, etc.

It was proposed to reserve half the space in the new gallery for a Section of Economic Botany. These proposals were sanctioned by the Trustees at a meeting held on December 22, 1925 and arrangements are now being made for taking over the new gallery.

In the meanwhile the work of preparing the exhibits for the Invertebrate Section was taken in hand and a series of Student's introductory Cases illustrating various phases of Insect Life were prepared. Such phases as Structure, Classification, Metamorphoses and Growth, Means of Defence, Mimicry and Protective Colouration, 'Insects in relation to disease' are each separately illustrated. The method adopted breaks up the monotony of a continuous series of exhibits. The cases represent compact chapters on Insect life enabling the visitor to take up the study at any point which attracts him most. Carefully keeping before us the axiom that in order to educate the visitor one must first attract and interest him, very great attention has been paid to the method in which these exhibits are presented. Very beautiful and attractive models illustrating the various stages in the life histories of Insects, particularly those noted as carriers of disease, were prepared in the Society's Laboratories. The series is further illustrated by carefully mounted specimens and a number of photographs and drawings. We were very fortunate during the year in being able to enlist the support of Mr. F. V. Evans, a life member and Vice-Patron of the Society, who has kindly consented to present the Society with a set of enlarged models of the House-fly and the Mosquito of the type now exhibited in the Central Hall at South Kensington. These models cost about £ 70 a piece and would have been quite beyond our reach had it not been for Mr. Evans' generosity to whom our thanks are due. The Introductory Cases will be followed by a series of cases displaying the commoner forms of Insect Life in India and the same system will be adopted in the treatment of the other classes of the Invertebrate kingdom.

VISITORS

His Excellency Sir Leslie Wilson, P. C., G. C. I. E., C. M. G., D. S. O., paid a second visit to the Natural History Section in December 1924. He was received by the Trustees of the Natural History Section and conducted over the galleries by the Curator. His Excellency stated that he was very pleased with the considerable progress that had been made since his last visit to the Natural History Section and also expressed a desire to visit the Society's Laboratories at 6, Apollo Street, where he was able to see work of the Taxidermist Department in progress.

We are unable to give exact figures to indicate the extent to which the Museum is being made use of by the general public, except to state that it is becoming increasingly popular with all classes of visitors.

CURATOR'S VISIT TO AMERICA

Curator's Deputation to America

In 1922 Mr. S. H. Prater, then Assistant Curator, proceeded on deputation to England to study Taxidermy and Museums in England and on the Continent. The use Mr. Prater made of his opportunity has been of great value to the Society and to the Museum and he has shewn that he is not only able to absorb but to give out to others what he has absorbed. During a visit paid in 1925 by the Honorary Secretary to the U.S.A. he discussed with the authorities of the New York Natural History Museum the possibility of Mr. Prater's studying at the Museum for a few weeks, and the suggestion was favourably received. The Museum in New York is a wonderful one and to us in India unique in that the citizens of New York vie with each other in eagerness to keep the Museum supplied with all the funds it requires. In the Museum the Secretary observed the Taxidermists at work mounting for exhibition the fine collection of Indian Animals obtained as the result of the Verney-Faunthorpe expedition in 1924. The U. S. A. will have a finer exhibit of Indian Game Animals than any Museum in India has and since we cannot hope to obtain the financial resources the New York Museum has we can only study their methods and copy the ideas and ideals they have placed before all lovers of nature. At the latter end of 1925 Messrs. Theodore and Kermit Roosevelt visited India on a collecting trip for the Field Museum of Natural History, Chicago, and the Society was fortunately able to be of assistance to them. Both these gentlemen have become members of the Society and have promised to help Mr. Prater should he visit America. Proposals will therefore shortly be placed before the Committee of the Society and the Trustees of the Museum to enable Mr. Prater to proceed to America for a few months.

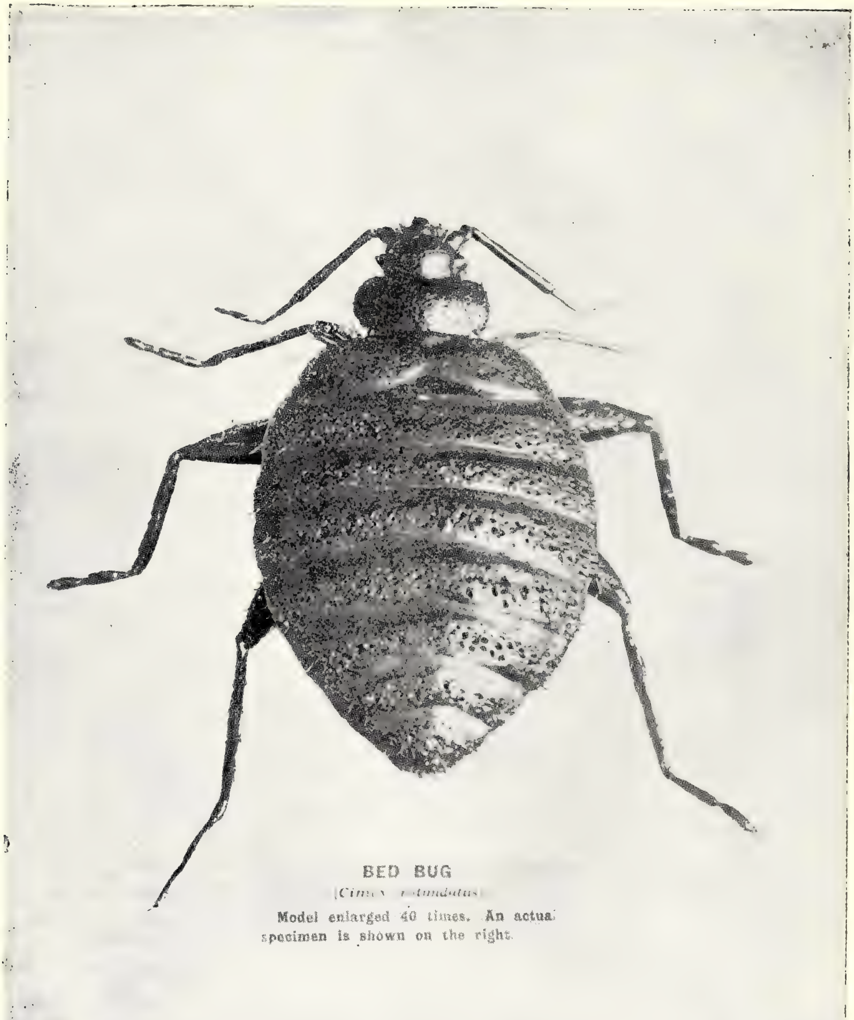

BED BUG
(Cimex rotundatus)
Model enlarged 40 times. An actual specimen is shown on the right.

Photo of an enlarged model (× 40) of the Bed-bug (*Cimex rotundatus*). One of a series of insect models prepared in the Society's Laboratory to illustrate the case on 'Insects in Relation to Disease.'

EDITORIAL

We have great pleasure in announcing that His Excellency Baron Irwin, G.M.S.I., G.M.I.E., Viceroy and Governor-General of India, has become a member of the Society in his private capacity, and as Viceroy of India has consented to be a Patron of the Society. We are therefore in the proud position of having as our Patrons, His Majesty the King Emperor's representative in India and His Royal Highness the Prince of Wales, the Heir-Apparent.

We publish on pages 196 to 206 of this number the Report of the Society for the year 1925. His Excellency the Governor Sir Leslie Wilson, as President of the Society, presided at the Annual Meeting of Members held on the 9th March, 1926, and, as our main editorial, we give part of the address he then made to the members.

'I have seen recently in the Press a rather interesting controversy as to whether our earliest ancestors, the primitive men who dwelt in caves, were artists before they became cooks, and this view has been supported by the statement that traces have been found of mural decorations dating back to a time before the use of fire was known. Whichever view may be correct, I have no hesitation in saying that the primitive man must have studied the habits of the animals and birds around him in the most careful manner, from the point of view of self protection, before he either made pictures of them to adorn the walls of his cave, or attempted to turn the tables upon them by making use of them for food. It is clear, to me, that our earliest ancestors must have been enthusiastic naturalists before they were either artists or cooks, and that the formation of the first Natural History Society must date back to a period of the very remotest antiquity.

I have listened with very great interest to the extracts from the annual report of your Society which have just been read and the first point that occurs to me is the fact that whereas, before the war, there were about 2,000 members of your Society, the membership has now dropped to about 1,200. It is very likely that the hard times through which we have been passing since the war may have something to do with this, and particularly in Bombay the great increase in office work, and the consequent decrease in opportunities to study nature, may be factors contributing to this unfortunate result. I am glad to learn that a circular letter, addressed to all members at the beginning of this year, has had some effect, but I would like to remind members of the Society of what they can do to help it by persuading other new members to join.

One of the most important features of the work undertaken by your Society is the help which it is able to give to the cause of education by providing facilites for nature study. I am glad to learn that there is full agreement between Government and your Society as to the measures that should be taken to encourage nature study in the Schools; but, like so many other excellent schemes, our proposals are hampered by want of funds. Government has already declared its approval of the following suggestions made by the Director of Public Instruction in consultation with your Society, namely, the creation of an interest in the study of natural history among the teachers under training in the Secondary Training College, Bombay, by the establishment of a Nature Study Club closely associated with that College and secondly, the introduction of special courses in the vernacular training colleges. The proposals for the appointment of a Lecturer in the Natural History Section of the Prince of Wales' Museum, which are referred to in your report, have not yet been submitted officially to Government, but even if we had received them, it is most unlikely that they could have found a place in the Budget owing to our difficult financial position this year. I agree, however, that it is very desirable that such an appointment should be made, and I would appeal to those well-to-do citizens of Bombay who are interested in the question of nature study to help the Natural History Society to carry out their scheme for at least one year. At the end of that time it will be evident either that the work is of such a nature as to deserve assistance from Government, or it will be shown that the time is not yet ripe for teaching nature study to the youth of this country.

Personally, I believe that the experiment is likely to prove successful, and I am anxious to encourage the teaching of nature study in the Schools, especially as it is of so much interest to the Boy Scouts, who are now forming a very considerable proportion of our school-going population.

We must all, I think, be very grateful to the Natural History Society for the assistance which it has rendered to schools and colleges, to hospitals and dispensaries, and to other public institutions in the course of the year, and the Society itself must be particularly grateful to Mr. F. V. Evans for his very valuable gift of books dealing with Western India, and for the very interesting pictures of Bombay which are now on exhibition in the Art Section of the Prince of Wales' Museum.

I trust that the proposed deputation of Mr. Prater to America will commend itself to your Society. I feel sure everyone shares, with me, a very keen appreciation of Mr. Prater's work, conducted, as it has been, under circumstances of considerable difficulty and inconvenience but with an ability which deserves all praise. Mr. Prater has conclusively proved that he can, to the benefit of Bombay, take advantage of the opportunities offered to him, and I am sure that his proposed visit to America will be of the greatest value. The report shows what a large amount of money is spent in America on the study of Natural History, and on the upkeep of the Natural History Museum in New York, and I believe that Mr. Prater will gain very valuable experience from a study of what is being done there. Should the proposed deputation take place, I feel sure that Mr. McCann, the Assistant Curator, will seize the opportunity to show to the Society that the training which they have given him has not been wasted, and that he is able and willing to undertake the duties of this important post in the Curator's absence.

It has been a great pleasure to me to attend, for the first time, your annual meeting, and I have been much interested, as I always am, in the excellent exhibits in the Natural History Museum.

I have often spoken to people who have lived in Bombay for many years, and find, to my great surprise, that many of them have never even been to the Prince of Wales' Museum, and had no idea of the excellent Natural History Section we have there. Similarly, visitors from overseas to Bombay do not visit the Prince of Wales' Museum in great numbers, and I cannot help thinking that we want to make the Museum better known. I will not speak, to-day, of the many objects of art, ancient and modern, or of the excellent armoury, to be viewed with great interest, but the Natural History exhibits alone are well worth more than a short visit to residents and visitors alike. If we could only get the public to realize what a great deal has been done during the last few years for the Natural Histery Section, I believe the Society would get a very largely increased measure of support, which it so thoroughly deserves.'

We look forward with keen anticipation to receiving from public-spirited citizens of Bombay the funds necessary to start Nature Study courses for teachers and for students in Secondary Schools.

We have very great pleasure in publishing the following resolution of the Managing Committee dated February 27, 1926 :—

' Resolved that in view of his continued interest and support in the work of the Natural History Society that Mr. F. V. Evans of 7 Haymans Green, West Derby, Liverpool, be appointed a Vice-Patron of the Natural History Society with effect from January 1, 1926.'

and as editors would like to express to Mr. F. V. Evans our sincere thanks for the help he has given us.

We are sorry to lose from the Committee Mr. J. D. Lewis who served as Treasurer from April 1, 1925 to Febuary 28, 1926, during the absence of Mr. G. F. J. Cumberlege, D.S.O., M. C. Mr. Lewis has been transferred to Manilla and we hope he will act as an advertising agent to the Society whilst there. We echo the vote of thanks passed to him at the general meeting. Mr. Cumberlege has resumed his old duties as Honorary Treasurer and we welcome him back.

We learnt with very great regret of the death on April 1, 1926, in the Isle of Wight of Mr. E. Comber, F.Z.S., M.B.O.U., an old member of the Committee, at one time Secretary of the Bird Section of the Society, a keen Naturalist, an esteemed contributor to the Journal, and a valued friend to those responsible for the running of the Society.

Mr. Comber was an all round sportsman but will perhaps be best remembered, apart from his work as a naturalist, for his skill as a Yachtsman.

He became a member of the Society in 1894, joining the Committee in 1901. He was keenly interested in Birds and also in Hymenoptera. In addition to various notes on the distribution of Indian Birds, the following papers from his pen were published in the Society's Journal :—

> Some Hints to Beginners on Collecting and Preserving Natural History Specimens—Mammals, Birds, Reptiles and Amphibians, Fishes. The Oriental Region and its position in Zoological Geography. The Collections in the Society's Museum. Breeding Seasons of Big Game. The Economic uses of Shells. A List of Marine Mollusca in the Society's collection. Catalogue of the Fresh Water and Land Mollusca in the Society's collection. Protective Legislation for Indian Fisheries. The Birds of Chitral. On Nets used by the Fishermen of North Kanara. The Classification of Lepidoptera.

He was also responsible for the publication of the first two general indexes of the Journal.

Men like Comber seem difficult to replace now a days. Twenty-five years ago it was the rule for one or two local members to drop in daily at the Society's rooms and work at collections they were interested in. We had several good naturalists amongst our local members. Mr. A. Abercrombie, Mr. E. H. Aitken, Mr. E. Comber, Father F. Dreckmann, Col. K. R. Kirtikar, I.M.S., Major G. Lamb, I.M.S., Mr. W. S. Millard, Lt.-Col. A. J. Peile, Mr. H. M. Phipson and Mr. L. C. H. Young. Their mantles do not seem to have fallen on any one. If they have the recipients seem to have forgotten to wear them, either this or they have forgotten the address of the Society and have overlooked the warm welcome which awaits them here.

We have also to record with deep regret the serious accident to Col. R. W. Burton who has been such a help to us for many years. Col. Burton was shooting in the Central Provinces and early in April fell from his machan and broke his thigh and wrist.

Col. Burton—though you would not think it from his energy—is not a young man and we fear will not recover as quickly as he would have thirty years ago but we sincerely hope his accident will not say *finis* to his *shikar* in his beloved Indian Jungles.

We have also said farewell to our Senior Vice-President Sir Norman Macleod, who has retired to England on relinquishing his office of Chief Justice of the High Court of Bombay.

A relative of J. D. Inverarity, Sir Norman, shared with that great lawyer his love of *shikar* and the jungle and few can have had more knowledge than Sir Norman of Small Game Shooting in the neighbourhood of Bombay. His presence will be greatly missed at meetings of the Committee.

We should like to close on a note of pleasure and on behalf of the members of the Society express to our President our joy at the news that Lady Wilson has been restored to health.

REVIEWS

'The Vegetation of Burma from an Ecological Standpoint.'

By L. Dudley Stamp. Thacker, Spink & Co., Calcutta, 1925

(*28 Plates and Numerous Maps.*)

The writer states in the Preface that 'the present work has grown out of a paper dealing with the Ecology of part of the Dry Belt of Burma, by Mr. Lord and himself, which was published in the *Journal of Ecology* in September, 1923.'

We have always deplored the absence of a comprehensive account of the vegetation of Burma as a whole. Vegetation maps which have been published so far in atlases and on wall maps are very unsatisfactory and often misleading. We must be grateful to botanists like Dudley Stamp for increasing our knowledge by laborious and comprehensive surveys and especially by stimulating other workers to put in the details on the ground mapped out by him in broad outlines.

After a concise and lucid description of the factors governing the distribution of vegetation (elevation, climate, geology and soil), the author proceeds to divide the natural vegetation of Burma into a number of types. Considering the present state of our knowledge these types are not all of the same value: some are fairly well defined, others are little known. They number 35 and are grouped under 3 main-heads :

I. Mountain Vegetation (above 3,000 feet or the Frost line).
II. Lowland Vegetation (below 3,000 feet).
III. Seral Communities.

In the last chapter, which is entitled 'Geology and Ecology' the author make some interesting remarks on the practical value of the study of ecology and, consequently, also of systematic botany, for the advancement of agriculture and forestry.

We quote the following from page 45 : 'A very large proportion of the wealth of Burma comes from its agriculture and forestry. The artificial vegetation of a country—that is really its agriculture—is controlled by climate and soil no less than its natural vegetation. Any successful attempt at the introduction of new crops into Burma, as well as the extension of the area under existing crops must of necessity involve, whether we recognize it under that name or not, the study of the ecological relationship of the crops concerned. A study, even a simple study, of ecology of the natural vegetation supplies an enormous amount of information. The writer's collaborator in ecological work in Burma (Mr. L. Lord, I.A.S.) commenced this interesting and valuable study but sufficient work has not yet been done to permit of any generalization. Taking just the borders of the Dry Belt, however, there may be noted in the Thayetmyo District such relationships as these :—

(1) Clearings (taungyas) in Vitex Forest on Peguan Sandstones are suitable for wagyi cotton.

(2) Clearings in rich type of Sha Dahat Thoron Forest on Red gravels are also suitable for wagyi.

(3) Clearings in *Diospyros* Forest seem suitable for groundnuts.

(4) Clearings in Sha Thorn Scrub are suitable for groundnuts or sesamum when on sands but not when on clays.

(5) Clearings in Sha Thorn Scrub are suitable for levelling, clearing away of surface soil and irrigation for paddy when on Peguan clays but not when on sands (i.e. the opposite of groundnuts.)'

This one example taken from one District shows that there is an immense field for study, not only in Burma, but all over India. It is a study of theoretical interest as well as of vast economic importance. We can understand that Government is not interested in the theoretical part of the question, but it is almost incredible that they should continue shutting their eyes to the practical side of studies which promise far-reaching consequences to the economic development of the country.

E. B.

'INDIAN NATURE STUDIES FOR CHILDREN.' By C. H. Donald, F.Z.S., M.B.O.U. (Mufid-i-'an Press, Lahore, and sold by Messrs. R. S. Gulab Singh & Sons, Lahore : Price 8 annas).

Our member Mr. C. H. Donald, who is well known as a contributor to various periodicals and as the author of several books on nature studies, has now published a small book which is intended to inculcate a taste for nature in the more advanced of the younger scholars of an Indian School. It is often a matter of complaint that Indian boys take no interest in nature in spite of the vast field that lies around them ; and, in an age which in the West is tending more and more to regard nature study as a most important ingredient in the education of the young, it seems a pity that more active endeavours are not made to overcome this defect.

Mr. Donald's little book is well worthy of attention both from pupil and teacher. The pupil who reads it will find an introduction to various aspects of nature which by awakening interest in them may lead him to enquire further for himself and so awaken his powers of observation and investigation. The teacher may learn very practical methods of teaching his pupils and leading them to these same ends.

The book is divided into short chapters which are entitled walks ; the author goes out with a number of small boys teaching them something about the common objects of the Indian country side ; and Mr. Donald has most skilfully verified the subject-matter of his walks, so as to avoid monotony, touching lightly on one subject and another in such a way as to whet the appetite for further information. And through the interest of it he has also skilfully woven a lesson, that the gifts of nature are to be conserved for the benefit of man ; he points out how birds are the friends of the Zamindar in various ways and how wasteful it is to destroy them ; while another chapter suggests to the youthful mind the value of the close seasons for fish, which are enforced by the department of which Mr. Donald is the able warden, and which is usually regarded as merely another proof of the satanic government's love of interference with the people for interference's sake.

Simple though the subject-matter of the text may be it has been written with an easy pleasant style that has a charm of its own ; and we can recommend the book not only to the pupils and teachers for whom it is intended, but also to the new-comer to India who is desirous of his first introduction to the wonders of the Indian country side.

H. W.

'A HANDBOOK OF THE BIRDS OF EASTERN CHINA' by J. D. La Tonche, C.M.Z.S., C.F.A.O.U., M.B.O.U., Part I, July 1925, Price 7*s.* 6*d.* net. (Taylor & Francis, London).

We have received the first part of a new Handbook on the Birds of China which is to be issued in parts of Messrs. Taylor and Francis. The author is Mr. J. D. D. La Tonche, well known as a most experienced and hardworking ornithologist who has made Eastern China his especial province and who has greatly contributed to our knowledge of that interesting region.

The present work is to embrace the six maritime provinces. Chilili, Shantung, Kiangsu, Chekiang, Fohkien, and Kwangkung, together with the two inland provinces of Kiangi and Anhwei. It has been planned on up-to-date lines, incorporating the latest results of all the study of the last quarter of a century which has produced such a revolution in Ornithology. The local geographical races have been carefully worked out and the nomenclature brought up to date, both as regards the use of correct names and trinomials.

The format is very much the same as that of our well-known 'Fauna of India' series, except that the text figures illustrative of the principal generic characters have been replaced by halftone plates illustrating typical views and features of interest.

The interest of this book for workers in India is not very direct though many of the forms treated of are geographical races of familiar Indian and Himalayan birds ; but it is always of value to consider birds with which we are concerned in the light of what has been recorded of their near relatives in other lands.

For the Ornithological student in China however the value of the work will be immense. It brings up to date the varied information which has been collected in the last 50 years since the publication of the last standard work of David and Oustalet's '*Oiseaux de la Chine*', long out of date and long unobtainable ; and it gives him, as Mr. Stuart Baker's new edition of the 'Fauna' is giving us in India, a new starting ground from which to work and fill in the gaps in our present knowledge. We congratulate the author on this first instalment of his task.

H. W.

THE FAMILIES OF FLOWERING PLANTS. By J. Hutchinson, F.L.S. Macmillan & Co., Ltd., London, 1926

Ever since the days of Linneus botanists have endeavoured to base the classification of the vegetable kingdom on natural lines and after Darwin placed the theory of evolution on a firm foundation they have sought for a phylogenetic system. That evolved by Engler and Prantl received a warm welcome for that reason but as time passed this first enthusiasm has cooled down and it has been felt more and more that even their arrangement is not entirely satisfactory, so that many systematic botanists, at least British ones, have preferred to adhere to the older method of Bentham and Hooker pending the appearance of a scheme on more natural lines. Readers of the Kew Bulletin (1923) are aware that Mr. J. Hutchinson, F.L.S., Assistant at the New Herbarium, has been engaged for some time on such a work. He has now published, through Messrs. Macmillan & Co., a book [1] embodying his conception of the Dicotyledons based on probable relationships as seen in the light of modern knowledge of plants past and present and their distribution. In the author's view, and he is supported by a large section of botanists, the evolution of the flowering plants has not followed a single line but along at least two parallel lines of descent, or better ascent. Engler and Prantl assumed that simplicity in the flower indicated primitiveness and therefore placed the *apetalous* families first as the oldest. This idea has had many critics. It is now universally accepted that the parts of flowers are modified leaves on a shortened stem and if that is so then the smaller degree of modification should denote the older member in the line of evolving plant forms, leaving out of consideration, for the moment, the fact of simplicity by reduction and atrophy. It follows, as is stressed by Mr. Hutchinson, that carpels formed by single separate leaves as in apocarpous fruits must be an older form than syncarpous fruits consisting of more than one carpel, and as many apetalous flowers have syncarpous ovaries, apetaly cannot be taken as denoting age or primitiveness. It would seem, therefore, that flowers made up of numerous and separate parts must have preceded the forms with more united and fewer parts. Mr. Hutchinson reverts, therefore, partly to the arrangement of Benthem and Hooker which placed the *Ranales* (*Ranunculaceae*, *Nymphaeaceae* and others) at the root of the phylogenetic tree. As already stated, however, this lead along a single line is not followed further, for Mr. Hutchinson produces an ingenious conception of a division according to tendencies, that is to say, based on the fact that certain characters are predominant, and at the inception he segregates out two lines distinguishing those families having the 'arborescent habit predominant', as in the *Magnoliales* from those with the 'herbaceous habit predominant' as in the *Ranales*. He selects then these two orders as the originators of the two lines of descent, the former culminating in the *Apocynales* and the *Rubiales* and the latter in the *Umbelliflorae Campanales*, *Gentianales*, *Geraniales*, etc. But this is not all; from both lines offshoots by degeneration and evolution tend to draw towards each other and we thus get the *Apetalae*, some of which, like the *Laurales Fagales*, *Euphorbiales* and part of the *Urticales* are derived from the arboreous stock and the others, such as the *Piperales*, *Polygonales*, *Proteales* and the rest of the *Urticales* from the herbaceous. Both lines send out culminating shoots to meet in the *Asterales*, probably the highest group of the vegetable kingdom. It would take too much space to go into the matter further here, indeed, Mr. Hutchinson has framed his thesis so tersely that it would hardly be possible to set it out more concisely than by quoting his own words in full. The scheme is made clear by the introduction of a phylogenetic diagram showing the affinities of all the dicotyledonous orders and families.

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[1] *The Families of Flowering, Plants I.* Dicotyledons by J. Hutchinson, F.L.S., Macmillan & Co., Ltd., London, 1926, pp. xiv and 328, frontispiece and 264 illustrations and 29 Maps in text. 20 shillings.

The author has based his scheme not only on the anatomical details of the families but has taken into consideration the plants of past ages and the geographical distribution of existing plants.

In a short introduction the situation is reviewed, the general principles followed are laid down and in addition there will be found a table summarizing the fundamental differences between the three conceptions of Bentham and Hooker, Engler and Prantl and the one under review. The author has been at pains to quote necessary references to the pertinent literature. There follows a conspectus of the principal groups of the living flowering plants. All this takes up but a small portion of the volume, the rest being devoted to what will prove a most useful compilation for field workers, especially for beginners in a new sphere. This part is an artificial key to all the families of Dicotyledons throughout the world. These comprise further reductions in the size of families and, therefore, a larger number than is to be found even in Engler and Prantl or in Engler and Gilg's *Syllabus*. Thus the *Magnoliaceae* are split up into the families *Magnoliaceae*, *Winteraceae*, *Schizandraceae*, *Trochodendraceae*, *Himantandraceae* and *Cercidiphyllaceae*. Few will quarrel with the author for making the long-overdue division of the *Leguminosae* into the separate families of *Mimosae*, *Caesalpinae* and *Papilionaceae*. Thus against 280 families, including the Monocotyledons and Gymnosperms comprised in Engler and Gilg's work Mr. Hutchinson has 264 for the Dicotyledons alone. The key is simple and easy to use and though, of course, it is not any indication of phylogenetic relationship, it affords a ready means of running down any plant rapidly to its family.

Following the key, which takes up fifty pages, each order and each family is briefly described, the chief characters being enumerated and references are given to the corresponding number in both the Bentham and Hooker and the Engler and Prantl systems. The distribution of the family and some of the useful products of its members are also mentioned. This descriptive portion has been very wisely fully illustrated with figures of at least one carefully selected species for each family that is more or less typical. The 264 figures, all excellent, are the work of the author himself and of Mr. W. E. Trevithick. Many are original but many also have been copied from various sources and in that case the source is acknowledged. A number of outline maps also find place to indicate the distribution of certain critical families and genera. On pages 78 and 79 will be found a useful 'list of families with certain more or less constant characters', e.g., those with 'opposite (or verticillate) leaves constant', or 'compound leaves predominant' or 'Glandular leaves.' This might well be extended to include milky or coloured sap, thorns, etc. and perhaps the author will consider this point in a future edition. A glossary and a full index conclude a work which is a distinct achievement and one on which the author is to be heartily congratulated.

As stated above, the present volume comprises only the Dicotyledons and a further volume is promised dealing with the rest of the flowering plants. It remains to say that the book is exceedingly well got up in every way and at the price of 20 shillings should be in the hands of every systematic botanist. The best conclusion to this review is the ultimate paragraph of the foreword written for the book by Dr. A. W. Hill, F.R.S., Director of the Royal Botanic Gardens, Kew:—

'Whether Mr. Hutchinson's new system be fully accepted or not, it will, I think, be readily conceded that this clear and admirably illustrated exposition of his views marks a distinct and noteworthy advance in our conception of the inter-relationships of the Dicotyledons, and forms a very valuable contribution to the study of the probable development and evolution of plant life.

'Diruit, aedificat, mutat quadrata rotundis' (Horace Ep. Bk. i. I).

KEW,   CECIL E. C. FISCHER.
February 1, 1926.

NOTICE

Through an oversight the price of *Familiar Flowering Trees* by Ida Colthurst which was reviewed in the last number of the Journal was stated to be Rs. 1-6-0. The cost of the book is Rs. 6.

MISCELLANEOUS NOTES

No. I.—WILD ANIMALS IN CENTRAL INDIA

Muntjac or Barking Deer.—In Miscellaneous Note III of Volume xxx, No. 3, Mr. R. C. Morris remarks as to the 'clicking' noise muntjac are often heard to make—'*The noise is only heard when the muntjac goes off in a clumsy bounding gallop, and never when it rushes off at full speed.*' That remark should, I think, refer to the short stoccato cries which signify that the animal has made out—or thinks it has—the cause of the rustling in the leaves, or other noise, at which it has been 'barking'.

The expression 'clicking noise' is always associated in my mind with the quiet 'clickings' made by both sexes of this deer when disturbed and moving quietly away in doubt as to what is the cause of the disturbance. I have frequently when stalking got quite close to muntjac, and when myself standing still heard this 'clicking' noise made by the animal which I could see through the undergrowth slowly walking away. This has happened in case of both sexes.

The 'clickings' made when at a walk could perhaps be made by the cloven hoofs coming together: but Mr. Morris describes it as made in a more violent manner than would be possible at a walking pace. Has he heard the noise, he has in mind, made by the animal when moving quietly away at a walk? The 'clicking' sound I have in mind can be likened to that made by two small bones being lightly knocked together; but could not be heard when the animal bounds noisily away, and has not been heard by me under those circumstances.

I, personally, agree with Mr. Dunbar Brander in taking the 'clickings' to be a vocal sound. It would be difficult, but not I think impossible, to ascertain by means of careful stalking and use of field glasses at short range exactly how the sound is caused. When found in suitable cover the deer can be caused to 'click' without much difficulty, but the nature of such cover precludes the closer observation required. I will endeavour to make the necessary observation during the coming cold weather and in any case will listen for the pause between every third stroke, this not having attracted my attention on previous occasions.

Use of Electric Light.—It is not possible to be dogmatic as to the use of electric light as an aid to shooting tigers over kills. Where beating is possible that method should not be resorted to. Most sportsmen will hold that view. In many of the jungles of India beating is not possible at any time, and during the cold weather months it is not feasible in most jungles. In such cases it is necessary to sit up over kills, and the use of electric light should not then be considered as 'overstepping the mark'.

Undoubtedly more tigers are nowadays shot over kills than used to be the case before electric light came into use. The sportsman was then mostly dependent upon the few nights of the month during which the moon was favourable. This—the undue diminution in the number of tigers—will, in the future, be *the* factor to rule the matter: and in those jungles, under the control of the Imperial Forest Department, where tigers are becoming scarce, the use of electric light should be prohibited. This would as a general rule be necessary in the interests of the people (cultivators) as well as of sportsmen.

Since Lord Lonsdale's remarks and the publication in the *Statesman* newspaper (June 10th, 1925) of a letter thereon over the signature of Colonel Wood, many letters on the subject will probably appear in the Press: and possibly the Editors of the Journal may be able later on to publish a commentary on the subject which can be accepted by sportsmen in India as a guide to the ethics of this matter of the use of electric light as an aid to shooting tigers over kills.

QUETTA,
4th August, 1925.

LT.-COL. R. W. BURTON,
Indian Army (Rtd.).

No. II.—ABOUT TIGERS AND LEOPARDS

Mr. Dunbar Brander, on pages 130 and 131 of his excellent book *Wild Animals in Central India,* discusses the length and weight of leopards ; in the course of his remarks he says :—

'Amongst others a number of figures are given by Colonel Burton in the *Bombay Natural History Society's Journal.* These measurements and the proportion of body to tail generally agree with those made by myself, but without calling into question for a moment the accuracy of the weights given, my weighments make the animal considerably heavier than he does. . . . Some of Colonel Burton's animals were killed in the Buldana District.'

In this passage the author appears to have confused two sets of figures given by two different people. I have never weighed a leopard, but on page 1063, (*vol. xxi, Journ. of B.N.H.S.*) I gave measurements of ten leopards which I shot in the Buldana District in April 1912, and I have killed about twenty in that District. On page 186, (*vol. xxiv, Journ. of B.N.H.S*) my brother Colonel R. W. Burton gave both weights and measurements of eight leopards ; these were not killed in Buldana, but in Godavari and Chakrata.

Longevity of Tigers.—It would be interesting to have some information as to the longevity of tigers and leopards.[1] An old pair of tigers which I shot one day in the Deccan were said to have been known locally for thirteen years. They had faded coats and much worn teeth. Mr. Dunbar Brander would appear to give a very long life to leopards ; for on page 130 of his book he mentions a black leopard he saw in the Melghat Forest in 1913, when it had already been there some years. In 1923 he writes that 'some day it will be killed', so evidently expects it to live some time longer, although it must then have been some fifteen years old for it was full-grown, and therefore four or five years of age in 1913. Perhaps there are some statistics as to the length of life of these animals in captivity, although these would not be a sure guide with regard to those in a feral state. I discussed this matter in an article in the *Asian* on February 19, 1901, but elicited no information on the subject. I have known a domestic cat live nearly eighteen years, and a hyena lived in the Royal Menagerie in Exeter Exchange from 1820 to 1846. A complete file of the defunct sporting newspaper, *Asian,* would be most valuable for its natural history records.

Black Tigers.—With regard to black tigers and leopards, Mr. Dunbar Brander on page 56 of his book refers to remarks on this subject in my monograph on leopards in the *Journal,* vol. xxvi, and is sceptical as to the oft-quoted Chittagong black tiger, the evidence for which I accepted. This black tiger certainly seems well authenticated. A full account of it, reproduced from an article in the *Field* by Mr. C. T. Buckland, was given in volume iv of the *Journal* in 1889, and seems to me to place its authenticity beyond doubt. As few members have access to the Journal of thirty-six years ago, the passage may well be reproduced here, so far as evidence is concerned. The writer said—

> 'Before I go hence and am no more seen, I wish to state that I and several others saw a dead black tiger in Chittagong, and from entries in my diary, which was pretty regularly kept, I know that it was in March 1846. The news was brought into the station that a dead black tiger was lying near the road that leads to Tipperah, distant two miles from Chittagong. In the early morning we rode out to see it ; but several of the party—Sir H. Ricketts, Mr. Fulwar Skipwith, Captain Swatman, and Captain Hore—are no longer alive, and I cannot produce any eye-witness to attest my statement, although several friends to whom I have written recollect that they heard something about it at the time. I remember perfectly well that the body of the animal was lying in the low bush jungle about twenty yards south of the road, and we dismounted to go and look at it. It was a full-

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[1] In a paper on the relative viability of Mammals, Birds in captivity by Dr. Chalmers Mitchell (P.Z.S. London, 1911. p. 425) the *Carnivora* are shown to have relatively long lives and high viability.

Bears reached 33 years, Lions and Tigers 17, Sea Lions 17, the smaller Cats 13, Viverrids 15, Hyaenas 13, Jackals 13, Badgers 12, smaller dogs and Foxes 10. Mustelines 10. *EDS.*

sized tiger, and the skin was black or very dark brown, so that the stripes showed rather a darker black in the sunlight, just as the spots are visible on the skin of a black leopard. The tiger had been killed by a poisoned arrow, and had wandered away more than a mile from the place where it was wounded before it lay down to die. By the time that we arrived the carcase was swollen, the flies buzzing about it, and decomposition had set in, so that those of our party who knew best decided that the skin could not be saved. I was young and inexperienced, but Captain Swatman, who was in charge of the Government elephant kheddas, and Captain Hore (afterwards Lord Ruthven), of the 25th N. I. were well-known sportsmen, and had each of them killed many tigers. No doubt was expressed about the animal being a black tiger, and I have often mentioned the fact in conversation from time to time. For several weeks before we saw the dead body, the natives had reported that there was a black tiger which infested the hills behind the military cantonment at Chittagong. . . . We did not attach any importance to the native statement that the tiger was black, as we supposed that this was merely an exaggeration. So also when a report came in through the native police that a man had been killed by a black tiger in a large village about three miles to the south of the hills behind the cantonment, we supposed that the epithet black was only a fanciful description of the animal. When, however, we had seen the black skin of the body of the dead tiger, we concluded that the native authorities had not drawn on their imagination when they used the epithet "black." '

Length of Tigers.—Mr. Dunbar Brander's remarks on the length of tigers should set at rest for ever the perennial controversy on this subject. If a twelve-foot tiger, and there is no more symmetrical animal in nature, were sketched out on a wall in its proper proportions, the observer would no longer listen to stories of such 'dragons of the prime.' *Hunting by scent.* 'The author mentions that the tiger does not hunt by scent, and 'has hardly any sense of smell.' I dealt with this matter in a paper (*volume xix, Journ. of B.N.H.S.*) my experience entirely agreeing with that expressed in this book. But, as was pointed out in the paper in question, it is remarkable that that fine naturalist and sportsman, the late of F. C. Selous, wrote that 'nothing can be more certain than that all carnivorous animals hunt almost entirely by scent.' This certainly does not apply to the Indian *Felidae*, although it appears to be the case with African animals.

Distribution of Tigers.—It is generally considered that the tiger is a comparatively recent immigrant into India from the north and from Central Asia, the most conclusive reason being that it is not found in Ceylon, which would be the case if it had migrated into Southern India before the separation of that island from the mainland. But I have always understood that by 'recent' was meant 'geologically recent,' a matter perhaps of a few hundred thousand or half a million years and not almost within historical times, as the author of *Wild beasts in Central India*, implies when he quotes Colonel Stewart in saying that there was in Sanskrit no word for 'tiger'. I am no Sanskrit scholar, but I think this language dates back something like three thousand years, and a thousand years less as a fixed language. It is uncertain whether it is Asiatic or European in origin, but if this is accepted as a reason for supposing that tigers were then unknown in India, then immigration is very recent indeed.

I am not satisfied on this point, and there seems to be room for a complete treatise on the goegraphical distribution of the tiger. I am not enough of a geologist to have any idea of the period of time that has elapsed since the separation of Ceylon from the mainland, or, what is still more important in this connection, the separation of Java and Sumatra, but that of Ceylon must presumably have occurred before the migration of the tiger to Southern India. Is there any reason why the tiger should have penetrated to Malacca before it reached Southern India? I have seen no discussion as to how or when the tiger came to Sumatra and Java, or whether there is reason to suppose that those islands were more recently joined to the mainland than was Ceylon. The straits of Sunda, which separate Java from Sumatra, are seventy miles wide, so the animals cannot have swum across. The fauna of Ceylon perhaps more closely approximates to that of the Southern India, although it has many special species of plants, than does the fauna of Java to that of the adjacent mainland. Certainly the seas north of Java and Sumatra are shallow and within the 100-fathom line, which points to comparatively recent separation due to or indicated by the volcanic system of the islands. But, all things considered, it can scarcely be believed that the southern migration of the tiger is more recent than the introduction of Sanskrit into India.

Another reason given for the immigration being recent is the impatience of the tiger to thirst and heat, but this is characteristic of most animals in tropical and sub-tropical regions, and is not peculiar to the tiger, for all seek shade in the heat of the day. Mr. Dunbar Brander gives as an additional reason 'the woolly nature of the cubs when born', pointing to an origin in a cold climate; but this wooliness seems to be a characteristic of the young of most animals. It would be interesting to know whether the sabre-toothed tiger, or other extinct species, is found in the Siwalik fossil deposits or elsewhere. It may be mentioned that the separation of Java was at a period sufficiently remote for the evolution of new species in that island. The question indicates the importance of geology in relation to natural history.[1]

Drinking habits of antelopes, etc.—Referring to the drinking habits of antelope and gazelle, and the author of this book has observed both these animals drink, as I also have done on many occasions. The error that they do not drink was initiated by Blanford and repeated by Lydekker who, however, after a kind of controversy on the subject extending over ten or twelve years, finally admitted the correctness of my observations. I dealt with this subject in a paper on *The Drinking Habits of Wild Animals* (*vol. xviii, Journ. of B.N.H.S.*) in which the case of the Chilka Lake herds of antelope, mentioned by Mr. Dunbar Brander on page 232 of his book, was fully elucidated. I have, since writing that paper, seen chinkara trooping down to drink at midday in Berar. The question of sub-species of gazelle, which the author also refers to, was commented on in another paper in the same issue of the Journal. There are, in fact, few observations in Mr. Dunbar Brander's excellent book, or in any other book on these subjects, on which the Journal of the Society does not throw some light, evidence of its wide scope. The Journal is, in fact, a mine of information to naturalists, and those who, like the present writer, possess a complete series from the first issue of this publication in 1886, are indeed fortunate.

Many other matters of great interest to the sportsman and naturalist are dealt with by Mr. Dunbar Brander, and the author's observations are of first-rate importance because they are generally based on personal experience, and not, like so many statements in books, particularly those by 'professional' naturalists, merely repetitions from other books. Hence it is that the observations recorded in *Wild animals in Central India* coincide with the experience of practical sportsmen and field naturalists. 'Science', said R. L. Stevenson, 'writes of the world as with the cold finger of a starfish', but a book of this kind is a live contribution to real science, and as good as a romance in other respects.

It is interesting to learn that the wolf is now a rare animal in the Central Provinces. There used to be many in Berar thirty years ago. An account of a pack of very destructive man-eating wolves in the Hoshangabad District of the C. P. in 1891 is given in volume vi of the Journal. I frequently saw them in Berar when I was shooting black buck and gazelle, and brought a few to bag. In 1889 a child was brought into hospital at Ellichpur with its throat torn open by a wolf, and in 1898 these animals killed a number of people near Jalna, where a pack of more than twenty was seen one day on the race course.

Speaking of wild cats, the author says he has known one even kill a peafowl. I shot one in a beat one day with a large pea-chick in its mouth.[2]

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[1] The genus *Machærodus* which includes the more typical forms of the extinct Sabre-tooths occurs in the Pliocene of France and Italy and also in Greece; Hungary, Samos, Persia, India (Siwaliks) and China. The Tiger is, as far as is known, exclusively Asiatic in origin. The modern Felidæ are said to be sprung either from the Oligocene genus *Amphicles* or from the creodont genus *Palæonictis* which is regarded as the direct ancestor of the Machærodonts. *EDS.*

[2] Jerdon writes of a Jungle cat walking off with a peafowl which he had shot. *EDS.*

The Journal (*volume, xxx, No. 3*) contains some notes on the pangolin. This creature is not, perhaps, as rare as it seems to be owing to its nocturnal and subterranean habits. It is occasionally found elsewhere than in forest or jungle districts. I saw some twenty years ago, one of these animals, and the skin of another, that had been caught in the cantonment of Bolarum. I have seen their tracks in several localities.

GLOUCESTERSHIRE,
ENGLAND.

R. G. BURTON,
Brigadier-General.

No. III.—CANNIBALISM AMONGST PANTHERS

I am sending you a description of a curious instance of cannibalism, on the part of a panther, in case it might prove of interest. A female panther had appeared in the neighbourhood here and was causing considerable destruction among the goats and dogs in the city. Although she displayed great audacity in her raids among the surrounding houses, taking dogs off verandahs, etc., she always, either devoured the entire kill, or failed to return to it.

A live goat was obtained and tied up on the edge of a near-by fort, which she was known to frequent. At about 9 p.m., a panther was heard to rush on to the goat. I turned on my light and observed a medium—sized panther. It was sitting on its haunches and holding down the goat with one forepaw. I fired immediately in an endeavour to prevent any injury to the goat. The panther dashed off, and the goat arose, appearing most unconcerned in spite of its somewhat alarming adventure. It was useless to search around in the dark, so I returned home, intending to come back early in the morning and remove the goat. I felt sure I had hit the panther well forward, and that I would find him lying dead near by. Imagine my disappointment, on returning early next day, when I found the goat killed and devoured. There was no trace of my having hit the panther. Everything seemed to indicate that I had missed the panther in the poor light, and that she had, in spite of the shooting, returned later and finished off the goat.

The following night, a buffalo was tied up. The panther killed again and had a large meal off the carcase. Again I sat up, but the panther failed to put in an appearance. The next day, some local grass-cutters found the body of a panther, some 300 yards from my *machan*. Having removed the claws and whiskers, they sent me news of their find. The panther proved to be a young one, though nearly full grown. The track of my bullet could plainly be seen as it had raked through the chest and abdomen. The animal had evidently rushed a short distance after being hit and then fell dead. The carcase had been lying there three days and was in an advanced stage of decomposition though still intact. I decided to let the process of nature continue, and to remove the skull the next day. To my surprise, on my return, I found the fresh tracks of a panther on a path leading towards the carcase. The latter had been dragged some ten yards, the surrounding dust showing plainly the tracks of the female panther. The entrails had been removed and set aside, whilst all the fleshy portion had been eaten. To confirm my views as to the devourer, the skin was lying nearly intact, as it had been rolled back during the course of the meal.

I understand that it is rare for a panther to eat carrion, especially if it is at all decomposed. The incentive of hunger does not appear to have been strong in this case, as the animal had two large meals within the previous three days, yet she appeared to prefer to turn cannibal and eat, possibly her own offspring, to returning to the buffalo carcase, and risking the unpleasant consequences, she had evidently experienced earlier in her life at the hands of some *shikari*.

I unfortunately never succeeded in bagging her, though she killed many times afterwards, and so cannot say whether she had any old wound which would account for her extremely cautious behaviour.

SATARA,
30th July, 1925.

H. J. RICE,
Capt., I.M.S

[Numerous instances of cannibalism in Nature have already been recorded on the pages of the Journal. These includes records of cannibalism amongst insects such as dragonflies and the larva of certain genera of butterflies and moths, cannibalism amongst reptiles and amphibians, amongst predatory birds and finally amongst mammals.

In volume xvii, p. 54 we published a record of a panther being attacked and slain on its ' kill ' by a second panther who appropriated the ' kill ' and finished by dining on its original possessor. The same writer records a similar experience with a tigress which, under like circumstances, was killed and eaten by a tiger. While two instances are on record of tigers eating their young. ' Dog does not eat Dog ' runs the proverb ; but in spite of the popular belief it is certain that cases of cannibalism, more or less flagrant are quite common in Nature and, not unnaturally, occur still oftener in captivity. *EDS.*]

No. IV.—JUNGLE TRAGEDIES

Miscellaneous Note II, in volume xxx, No. 3 of the *Journal* by Mr. R. C. Morris closes with a suggestion for further instances of jungle tragedies.

The photograph I send is an enlargement of one taken by Captain R. H. Haslam and sent to me in 1923. Some coolies employed on a tea estate in Travancore, where he was at the time, brought the tiger in from the forest near by saying they had seen several tigers fighting in an open space and that the party broke up when one tiger lay still.

One can imagine the timorous hesitations before the onlookers ventured to a nearer approach : Capt. Haslam said in his letter that the tiger had obviously been killed by a bite in the head, one canine-tooth having penetrated the brain. In the photograph the tooth hole can be seen in the centre of the skull. The quarrel was no doubt a sexual affair as there was no kill near the place where the incident happened.

QUETTA, LT.-COL. R. W. BURTON,
4th August, 1925. *Indian Army (Retd.).*

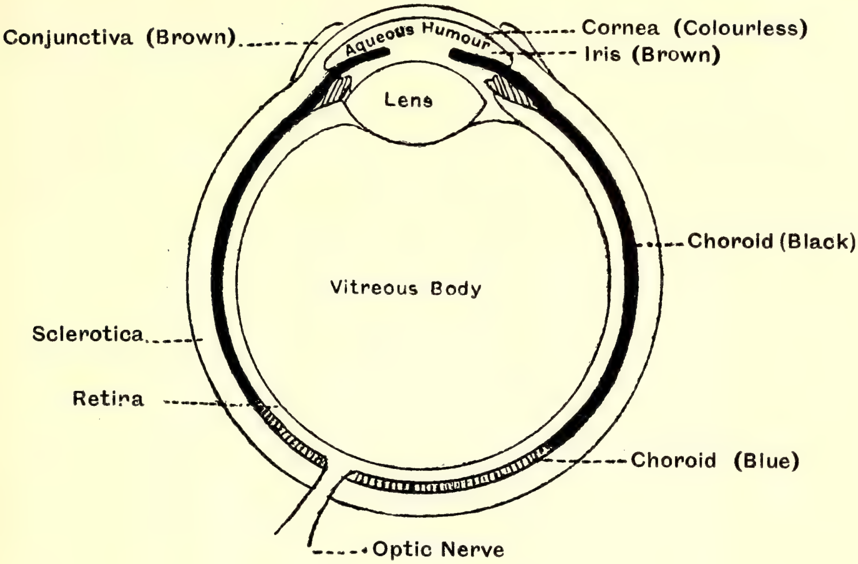
[The photo forwarded to us by Col. Burton shows the mark made by the tiger's tooth in the head of its victim. Unfortunately it is not sufficiently distinct for reproduction. *EDS.*]

No. V.—ON THE COLOUR OF THE EYE OF THE GAUR OR INDIAN BISON (*BIBOS GAURUS*).

Some comments have recently appeared in your Journal on the colouration of the Gaur's eye. I have no gaur's eye here for re-examination but there are in unlimited number of pure bred Aberdeen Angus cattle eyes at my disposal. To all intents and purposes the eyes of the two animals are identical except that in the Angus the brown is darker and the blue deeper and more pronounced. Bearing in mind these two differences the following remarks apply equally to both species. The examination of the eye in the living animal conveys the following impressions :—

The first general impression is that it is a large soft eye of great depth. Detailed examination shows that the general colour of the eye is brown and it is clear that the pigmentation giving arise to this colour is of varying shades and is situated at varying depths in the eye itself. In certain lights and at certain angles the whole eye appears brown. But in most lights and by arrangement so as to produce favourable conditions the transparent unpigmented portion of the eye, called the cornea, transmits a deep blue light. This light is entirely confined to this portion of the eye but it is obvious even without dissection that the pigmentation giving rise to the blue colour is deep seated and somewhere at the back of the eye.

In many individuals, specially in those not bred from the purest stock, the blue varies in luminosity : there are bright patches or spots of blue. The above remarks will be explained in detail by the dissection of the eye, commencing at the visible surface.



Transverse section of the eye of one aberdeen angus bull.

The conjunctiva is brown covering all the portion of the eye which in the human eye, is white. The *Iris* is brown, the pupil is a slit. A cross section behind the cornea admits the removal of the lens with the vitreous body, and the choroid can be examined. The colour of this is very dark brown, it might even be called black, except at one place which will be dealt with latter.

So far nothing blue has been encountered only varying degrees of brown and it will be seen that there are no less than three sources of this colour all situated at varying depths. It is not to be wondered at therefore that the browns seen in the eye of the living animal are elusive. Right at the back of the eye in the region of the optic nerve the choroid is a brilliant irridescent blue or greenish blue. This pigmentation appears to be confined to the surface of the choroid as it can be removed disclosing the underlying dark brown or black. The blue patch is irregular both in shape and colour with spots or patches of lighter and darker blues and greens.

These colours are opposite the pupil and the blue light apparent in the cornea is derived from this source having passed through the vitreous body, the lens, and escaping through the pupil to be diffused by the aqueous humour between the cornea and the iris. Its source also explains the fact that the blue is not apparent at all angles.

It will be seen therefore that the eye is a brown eye and that the blue is reflected light from the back of the eye. The variation in the intensity of the blue accounts for the spots seen in the surface eyes of some animals. It is probable that in the case of the gaur, all of which can be considered to be absolutely pure bred, the eyes of many hundreds would have to be examined before finding any irregularity.

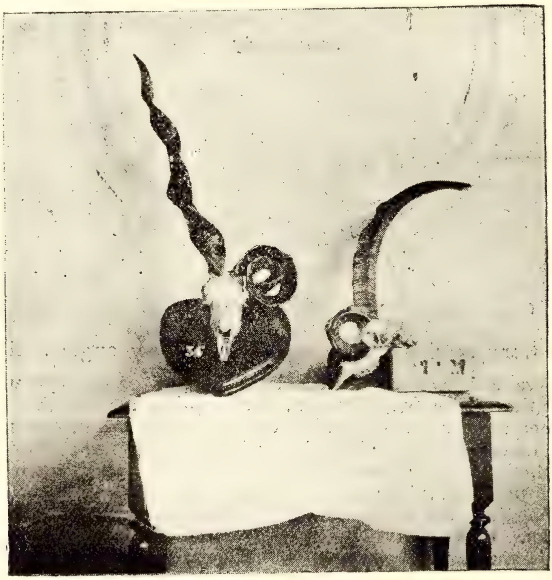
The above diagram explains itself and shows what I found when I examined the Gaur's eye and again more recently in a number of Aberdeen Angus cattles' eyes.

20th August, 1925. A. A. DUNBAR BRANDER.

[In volume iv of the Society's *Journal* the late Mr. J. D. Inverarity came to the same conclusion as Mr. Dunbar Brander and pointed out that the blue colouring of the Gaur's eye is due to the *tapetum lucidium*—the lining to a greater or less extent of the back part of the choroid membrane of the eye which, in the Gaur, is of a lovely peacock blue colour. It is this membrane which causes an animal's eye to shine in the dark. In the human eye it is opaque and black. *EDS.*]

No. VI.—MALFORMED HEADS OF MARKHOR AND IBEX

In 1921 I contributed to the *Journal* (vol. xxviii, No. 2, page 544) a photograph of a malformed ibex horn from Kashmir. In that instance the right horn had grown in very even concentric circles at right angles to the head. The accompanying photograph of head of a straight-horned markhor (*C. f. megaceros*) shows a similar less perfect malformation: and the ibex head photographed with it shows a malformation of the same type as both of the above.



This malformed ibex horn differs, however, in that the growth is forward and not at right angles. It stops short at the eye, and the condition observed at the end of the horn shows that the growth was completed and no further advance would have taken place. The horn is firmly fixed on the skull. The inner edge of the end of the horn has impinged upon, and slightly indented, the bone of the eye socket. The horn had grown over the end of the bone core; and when the animal was alive the inner corner of the horn must have been covered by skin of the animal's head. The animal was shot by a native ***shikari*** who brought the head to the McMahon museum.

It is a matter for curious conjecture as to what was the reason for the horn to stop growing. Had the growth continued it must have removed the unfortunate animal's eye: but it did not do so. Why?

The photograph was taken by me at the McMahon Museum, Quetta, by kind permission of the Curator, Mr. Clinton Bond.

QUETTA, LT.-COL. R. W BURTON,
4th August, 1925. *Indian Army (Retd.).*

CORMORANTS AND CATTLE EGRETS
Roosting site in the islands of Saheb Bandh, Purulia

NESTING SITE OF *Anastomus oscitans* IN THE
ISLAND OF SAHEB BANDH, PURULIA

No. VII.—WEIGHTS AND MEASUREMENTS OF THE NILGIRI LANGUR (*PITHECUS JOHNII*)

The following are weights and measurements of Nilgiri Langurs (*Pithecus johnii*) obtained by me at Kodaikanal, South India.

		Head & Body.	Tail.	Weight.
1.	Female	23″	32″	24 lbs.
2.	Male	24″	32″	26 lbs.
3.	Male	26″	28″ (damaged)	29 lbs.
4.	Male	25″	27″	27 lbs.
5	Male	26″	36″	30 lbs.

No. 1 a gravid female was secured on April 8, 1919. In Kodaikanal the young are born at the end of May and the beginning of June while in the Tinnevelly hills two young langurs, a few days old, were brought to me in Christmas Week, 1924.

ST. JOSEPH'S COLLEGE,
TRICHINOPOLY,
July 1925.

C. LEIGH, S. J.

No. VIII.—THE NESTING OF THE OPEN-BILL STORK (*ANASTOMUS OSCITANS*) IN PURULIA, MANBHUM DISTRICT

The occurrence of *Anastomus oscitans* in India is more or less confined to places which abound with large rivers and marshes. But in a district devoid of such physical features, the artificial lakes and tanks which supply suitable shelter and food appear in most cases to be frequented by these birds. Manbhum is one of such districts and my stay here during October and November 1924 gave me an opportunity of watching their movements. They are so numerous and well distributed throughout Manbhum that one feels surprised at the remark of Captain Beavan that he ' only met with this species on one occasion . . . so that its habitat is probably somewhat restricted ' (*Ibis*, New Series iv, p. 398). The fact of their occurrence here in large numbers can be explained by reason of the artificial lakes of considerable size which have been formed by running dams across small ravines or valleys, so that the enclosed space is filled by the natural drainage from above. Such lakes are locally known as *bāndhs*. The Sāheb-bāndh at Purulia, the principal town and head-quarter of the Manbhum District, is one of the largest of such *bāndhs* and encloses a stretch of about 40 acres of water. It embraces two well-wooded islands which the game laws of the district have helped to convert into bird sanctuaries and are therefore of special importance to the ornithologist. Birdshooting is strictly prohibited in the *bāndhs*. Situated as the islands are over 50 yds. off from the shore, they afford a complete immunity from human intrusion, and the islands being denseley-wooded provide a convenient site for roosting as well as nesting to many of the birds. It is patent even to a casual observer that to the Open-billed Storks the place is specially attractive on account of the fish and fresh-water molluscs which abound in the lake. For a whole month during my stay at Purulia I watched every morning parties of *Anastomus oscitans* coming from different directions and congregating on the islands of the Sāheb-bāndh,—usually small parties in threes and fours and sometimes single individuals traversing great distances across hilly jungly parts and hurrying towards the lake. Before descent, with a few spiral motions they wheeled rapidly round in the sky with outstretched wings, gradually sinking lower down till a sudden sharp plunge launched them on the tree-tops, whereof they seized the branches with their long and dangling legs and claws. Here they revelled in the sun for the greater part of the day. A powerful field-glass helped me to scan a few young birds in the group, and in two instances I noticed large circular nests of sticks built in the fork of two dead, leafless stumps, and observed their occupants, i.e. the young ones, which were fledged and somewhat grown up, shaking wings and clamouring for food before their parents. Subsequently, I watched the latter in the act of feeding their young. There were some other nests close by, but now deserted. The discovery of the young ones of *Anastomas oscitans* so late as the end of October was a surprise to me, as the normal period of nesting of this bird in Northern India is July-August ; and in view of the length of time which a young stork may take to grow and become independent of its parents, one can reasonably expect to find the young in the nest even in the latter half of September. The monsoon was unduly protracted, there being frequent showers in October. This might account for the lateness of the breeding season not only of *Anastomus oscitans* but also of cattle Egrets (*Bubulcus coromandus*) and Night Herons (*Nycticorax griseus*) which were still engaged in nidificatory duties in the neighbouring island within the *bāndh*. The congregation of the Open-bills in these islands lasted till evening when the parties would break up and disperse for roosting elsewhere in the jungly parts of the Bāgmundi range. But the fledgelings remained in their nest, probably with their parents, as I used to notice at dusk 3 or 4 birds there, but in the dim light I was unable to distinguish the young from their parents The nests of *Bubulcus coromandus* contained grown up young, while *Nycticorax griseus* was constructing its nursery apparently for a second brood ; for I watched the male heron carrying sticks for the hen bird which was busy arranging them in order. I also observed some nests of *Phalacrocorax javanica* which were now deserted but they contained grown up young in the beginning of October.

SATYA CHURN LAW.

24, SUKEAS STREET, CALCUTTA,
7th August, 1925.

No. IX.—OCCURRENCE OF THE SHELDRAKE (*TADORNA TADORNA*) IN BIHAR

It may be of sufficient interest to record that I to-day received alive a Common Sheldrake (immature plumaged) through Colonel H. Button, I.M.S. It was ' netted ' by the professional duck-netters on a jheel near Shonepur : there was another one with it. It is the first I have seen in these parts.

PATNA, BIHAR. JOHN A. BUCKNELL, F.Z.S., M.B.O.U.
16th November, 1925.

[The Sheldrake is an uncommon winter visitor to the northern portion of India. From Afghanistan and Baluchistan, where it is most rare, it extends as an unfrequent visitor to Sind, the Punjab the N. W. Provinces and Oudh. In Bengal its occurrence is rare but it has been obtained as far east as Arracan. *EDS.*]

No. X.—BIRDS-NESTING WITH A CAMERA

A CORRECTION

In ' Birds-nesting with a Camera in India,' Part iv, by Capt. R. S. P. Bates, published in No. 3, vol. xxx of this *Journal* we have a most excellent account of the birds breeding in the swamps of Kashmir with beautiful photographic illustrations of their nests and eggs.

One bird whose nest and eggs are described and figured in this article is however wrongly named. This is the Paddy Field Warbler (*Acrocephalus agricola*.)

The bird which has hitherto passed as *Acrocephalus agricola*, the Paddy Field Warbler, in Kashmir is not that bird at all, but is really *Acrocephalus concinens concinens*, the Chinese Paddy Field Warbler.

This latter breeds plentifully in the Hokra Sar and other swamps in Kashmir and is the bird described by Captain Bates. *Acrocephalus agricola* on the other hand does not breed in Kashmir.

SRINAGAR, B. B. OSMASTON, I.F.S.
KASHMIR.

No. XI.—NOTES ON BIRDS UNCOMMON IN, OR UNRECORDED FROM THE SIMLA HILLS

The Yellow-billed Blue Magpie (*Urocissa flavirostris cucullata*) :—With reference to Mr. H. Whistler's ' Note on the *Corvidæ* of the Punjab ' it may be of interest to record that on September 15, 1924, I obtained a specimen (juv. ♀) of the Yellow-billed Blue Magpie (*Urocissa flavirostris cucullata*) from a party of about half a dozen birds near Summer Hill Railway Station (elevation 6,700 feet). I have not seen the Yellow-billed Blue Magpie so close to Simla before. The Red-billed Blue Magpie (*U. m. occipitalis*) is, of course, a very common bird in and about Simla.

The Ashy-Swallow Shrike (*Artamus fuscus*). The distribution of the Ashy Swallow-Shrike (*Artamus fuscus*) is given in the new edition of the Fauna of British India, Birds, vol. ii, p. 349, as follows :—

> 'Throughout the Empire from Ceylon to the Himalayas East of a line drawn from Godra in the Panch Mahals to Nainital in Kumaon; resident throughout the plains and foot-hills up to 2,000 feet, and ascending the mountains up to 5,000 feet in summer. It extends throughout Burma, Shan States, Siam, Cochin—China, Yunnan and Western China.'

It is therefore worth recording that I was lucky enough to obtain a fine specimen of this interesting species on the July 5th, 1925, in Sirmur State, about 8 or 10 miles from Solon Railway Station on the Kalka-Simla Railway line. Simla is well outside the range of this bird as given by Mr. Stuart Baker and this appears to be the first record of the occurrence of *Artamus fuscus* in the Punjab.

I was on a two days' collecting trip in the vicinity of Solon (5,000 feet). On the first day I undertook a long tramp, because I wanted to cover as much ground as possible and to collect only such specimens as were worth obtaining. I had passed through some promising country, near villages and cultivation, and was skirting the base of a fairly bare, grass-covered hill on the summit of which grew a few pines (*Pinus longifolia*) when I saw, high in the air, a bird which looked like a big grey swallow, but with a short, white-tipped tail. This bird was along with two or three *Hirundo daurica nepalensis*. Its peculiar shape and comparatively large size attracted my attention and I watched it wheeling about in the air for a short while. Its flight was very graceful and rather swallow-like, but was characterized by a slower rate of progress than that of a swallow. After describing several circles the bird flew right across an open ravine and I lost sight of it when it crossed to the opposite hillside.

I sat down and waited for it to return, but as there were no signs of the bird, I turned and looked up the hill on which I was sitting. I was agreeably surprised to find another bird fly off from one of the pines high above, circle round once or twice, and then resume its perch. I lost no time in climbing up. As I approached closer I saw two birds sitting together and a third above on another branch. A harsh, grating cry was uttered by one or other of these birds. I was now certain that they were Ashy Swallow-Shrikes. Before I got close enough to use even my 12 bore shot-gun, the two birds which had been sitting together separated and I lost a chance of getting them both at the one shot. However I obtained one, the remainder immediately taking flight and disappearing out of sight over the crest of the hill before I could possibly shoot another. I failed to find them again. The bird I obtained proved to be an adult male, in which the genital organs were enlarged to about the size of a BB pellet.

The Large Brown Thrush (*Zoothera monticola*). In vol. xxvii, pages 401–402, of the *Journal* will be found a note of mine on the occurrence of the Large Brown Thrush in Simla. At the time I wrote that note I had not actually obtained *Zoothera monticola* in Simla, and the only specimen procured here was a single female, dated April 21, 1916, in Mr. A. E. Jones' collection. I am now able to add some further information on the subject.

I did not meet with this interesting thrush again till January 19, 1924. On this date a friend and I visited a ravine below Summer Hill and I was told by my companion that he has seen two largish thrush-like birds in the stream-bed. From his description I guessed that the birds were probably *Zoothera monticola*. My surmise was correct, for my friend came across the birds again and shot one. Unfortunately he fired from too close a range and the bird was unfit to skin—only the head was left intact, the rest of the body having been blown to pieces.

On January 20, 1924, we made a special excursion after the thrushes. We found one, apparently one of the two seen on the previous day, but it was very shy. We could not get a shot at it, for it flew off the moment it caught sight of us, taking refuge in an oak forest on the hillside above the stream, and when dislodged from its hiding-place, flying further in among the trees and refusing to be shifted again. A week later we made another attempt to get this bird, but although we saw it, we again failed to obtain it.

Some days after, on February 10, 1924, while on a ramble towards the north of Simla, another *Zoothera monticola* was met with. This was a stray bird which was feeding along with a number of *Turdus castaneus* and *albocinctus*.

I did not meet with the Large Brown Thrush again till September 27, 1924. On this date my friend and I explored another part of the ravine where the birds had been seen in January of that year. My companion was lucky enough to find two birds in a heavily-wooded part of the ravine and this time he shot both. I was some distance from him and only caught a hasty glimpse of the birds as they flew into thick cover. The two specimens obtained proved to be a male and a female—probably a pair.

The approximate elevation of the place where the birds were seen is about 6,000 feet.

From the information given above as to the dates on which this Thrush has been met with in Simla it is fairly certain that it is a resident species which probably breeds here, though, so far, the eggs have not been taken in Simla.

The Besra Sparrow-Hawk (*Accipiter virgatus*). On June 28, 1925, I paid a visit to a favourite ravine (elevation about 6,000 feet) below Summer Hill and one of the first birds I saw was what I at first took to be a smallish Sparrow-Hawk. It appeared suddenly, stooping at a number of small birds—chiefly House-Sparrows feeding on the ground, two or three Green-backed Tits and a pair of Flycatcher-Warblers. The Sparrow-Hawk had no trouble in catching one of these small birds, which it grabbed up and carried off into a thicket of bushes at the side of the ravine. The cries of the captured bird were heard clearly but the hawk could not be seen. After a few seconds it flew out of its hiding-place and perched on a low sapling overhanging the stream. It was shot easily. I found, however, that instead of obtaining a common Sparrow-Hawk I had procured a specimen of the Besra, (*Accipiter virgatus*) (F. B. I. No. 1248). I made a search for the bird it had captured (which was still in the hawk's talons when I shot it) but was unsuccessful. It was, I think, a *Seicercus*. The Besra Sparrow-Hawk was an adult specimen—a beautiful little male.

This Sparrow-Hawk has not been recorded from Simla before, and Mr. A. E. Jones does not mention it in his list of Simla birds (*J. B. N. H. S., vol. xxvi*). Mr. Jones has recently acquired a specimen—a juvenile male. Mr. H. Whistler thinks that he has seen the Besra near Mahasoo on two occasions.

SIMLA,
1st September, 1925.

S. BASIL-EDWARDES,
M.B.O.U.

No. XII.—RECORD OF A DEATH FROM THE BITE OF A HAMADRYAD OR KING COBRA (*NAIA HANNA*).

A CORRECTION

With reference to the Note (No. xiii) appearing in your *Journal* (volume xxx, No. 3,) headed 'Record of a death from bite of the Hamadryad or King Cobra (*Naia hanna*)' recording that Mr. Slater of the Mysore Geological Department was killed by a Hamadryad, I would like to point out that Mr. Slater was not killed by a Hamadryad, but by a Russell Viper. Mr. Slater was a collector of snakes, and knowing the sluggish habits of the Russell Viper he went up to the snake in question, and put his foot on it. The rest of Mr. Theobald's Note is substantially correct.

RALPH C. MORRIS.

HONNAMETTI ESTATE,
ATTIKAN P. O.,
26th October, 1925.

No. XIII.—NOTES ON SNAKES.

The following are notes on the snakes kept in the Serpentarium at St. Joseph's College, Trichinopoly. :—

1. **Pythons.** (*a*) In December 1914 the curator was bitten by a python. He was putting a nest of rats into the python's cage, the snake lying coiled up in the opposite corner apparently asleep. Before the curator knew that anything in particular was going to happen, the python had lunged out, the curator had instinctively withdrawn his hand, and the python was crawling back to his corner. The back of the curator's hand was torn in four lines from the wrist to the fingers, corresponding to the four rows of teeth in the python's upper jaw. A little dilute carbolic acid was rubbed into the wound to forestall complications, and no more notice was taken of the matter. The wound healed rapidly, and thirteen teeth which had been left embedded in the flesh gradually worked themselves out. The last came out on the eighth day.

(*b*) It takes about three hours to drown a python.

(*c*) The python in the Museum, 14 ft. long, weighed 44 lbs. alive.

(*d*) A python in the Museum workshop laid 13 eggs on May 17, 1925, coiled itself upon them, and remained incubating them till July 7, when it abandoned them. They were then hard and discoloured ; three only retained something of their original parchmenty appearance. On being cut open, these three were found to contain each a small python, 19 inches long ; one-fourth of the egg matter still remained to be absorbed.

This python remained two and a half months without food ; it promptly killed a rat that was put into the cage, but did not eat it. Another python remained six months without eating ; it refused all the dainties that an imaginative and impecunious curator could think of :—rats both white and grey, and bandicoots, crows in various stages of activity from the dead to the half dead, and clamorous owls, etc. Nothing happened to them, and after a few minutes the bandicoots nestled within the brute's folds and the crows perched on its back. Finally it was killed and skinned ; from the amount of fat it still had stored up it could have lived comfortably another six months without eating. 50 eggs from tiny ones ¼ inch to bigger ones 1½ inch in diameter, were found in the oviduct.

Some pythons sulk and go on hunger strike ; others eat readily enough. One, of the latter disposition, readily took a big owl (Dusky Horned Owl), stifled it in its folds and swallowed it without any difficulty, the wings being forced back along the body by a slight movement of the coils.

Another, two hours after being deposited in its cage, threw up what seemed to be a Palm Civet.

2. **Cobras.** Received in the Museum :

in 1923	19
in 1924	25
in 1925 (till June)	7

[1]Of these not one measured 6 ft.

Two measured	5 ft. 8 in.
One measured	5 ft. 10 in.

The conclusion is that a 6 ft. cobra is a rarity in these parts, if it exists at all.[2]

No two cobras are marked alike. The general pattern is modified in every individual. Two of the specimens received had double spectacles.

It takes about two hours and a half to drown a cobra.

A cobra killed on November 6 had five eggs in the oviduct. ready almost for laying.

3. **Russell's Viper.**

Received in	1923	7
Do.	1924	20
Do.	1925 (till June)	11

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[1] They were measured lying dead on the table, not stretched.

[2] A cobra killed in January this year by Mr. H. A. Boas, Palagapandy Estate Palghat, S. I. measured 6′ 3″. A specimen which taped 6′ 7″ is recorded in the *Journal* (vol. xxi, p. 718), *EDS.*

The largest measured 5 ft. A 4½ ft. specimen is a very good specimen; the average specimen is about 4 ft. Here again there is an extraordinary variety of markings on a same general pattern. No two specimens are alike. There are two colour varieties, one being slightly yellowish.

The Russell's Viper can squirt its venom. A specimen, with fangs, seized by the snake-catcher with his right hand, squirted two jets of venom on his left arm twelve inches away.

Krait (*B. cæruleus*). Having no chloroform I put a *Bungarus cæruleus* in a cigar box at the bottom of a bucket of water. Two hours afterwards it was alive and apparently none the worse.

4. **Rat-snakes.** The curator caught one on the Lower Palnis just under 10 ft. long. A 9 ft. rat-snake is by no means rare. A fine specimen not long ago fell down from the top of a coconut tree in the College garden, with a mynah in its mouth.

5. We once had a live cobra in the Museum. Late one evening a full-grown rat-snake was brought in, and as we had no spare box the new-comer was given as co-lodger to the cobra. The cobra ate him during the night.

ST. JOSEPH'S COLLEGE,
TRICHINOPOLY.

C. LEIGH, S.J.,
Curator.

No. XIV.—A BULL FROG (*RANA TIGRINA*) SWALLOWING A RAT

As I know you are a member of the Natural History Society, I feel sure you will be interested in a small incident of which I happened to be an eye-witness the other day. I have got some dogs of the Maltese spaniel breed which are good ratters. One of them noticed a big rat, about 4½ inches long, in a room in my house and chased it. The rat got into an adjoining bath room and from there attempted to escape through a pipe in the bath room for letting out waste water into a tank outside. As I was interested in the chase, I went outside to see what had become of the rat there and, to my great astonishment, I found that the rat had been swallowed alive by a medium-sized Bull-frog sitting just at the other end of the pipe where the water falls into the tank. There was no proof wanting of the act of gorging as the rat's tail was seen by me sticking out of the frog's mouth. The Frog is still in the tank and apparently none the worse for having swallowed the rat alive.

B. N. ZUTSHI.

RATLAM,
17th September, 1925.

No. XV.—FISHING IN THE PERSIAN GULF

A RECORD 'PIRAO.'

I enclose herewith a note on a 'Pirao', *Caranx jarra* caught from this ship by the two seamen shown.

The fish weighed 69½ lbs. and was caught at Henjam in June of this year. Quite a number of these fish were caught from the ship at anchor in 5 fathoms. 3 good size cod hooks lashed together were used as it was found that a single hook generally straightened out when a big fish was looked. The bait used was usually the head of a bream of about 2 lbs. and the fish were usually caught near the bottom and, even on the hand lines used struggled gamely and required a good deal of strength to land on board.

A number of shark were also caught, usually about 4 feet in length, though one of 11 feet was hooked. This fellow was hauled clear of the water under the counter but when his full weight came on the hook his struggles straightened out the hook and he got away before he could be killed.

The hook in this case wsa the regulation shark hook fitted with chain pendant supplied to all H. M. Ships.

EAST INDIES,
H. M. S. TRIAD.

G. E. BOULTBEE,
Lt., Commander, R. N.

[Major W. H. Lane in his interesting articles on 'Game Fishes of the Persian Gulf' (*Jour, B. N. H. S.*, vol. xxiv, p. 726) gives the measurement of a large Pirao (*C. jarra*) taken at Jask. The fish weighed 68 lbs. and measured 4½″ to the tip of the tail with a maximum girth of 36 inches—and yet he weighed only 2 lbs. under 5 stone ! *EDS.*]

No. XVI.—ON THE OCCURRENCE OF THE GIANT WATER-BUG (*BELOSTOMA INDICUM*) IN SIMLA

It may interest you to know that I caught a fine specimen of what I take to be the Giant Water-Bug (*Belostoma indicum*) here on 15th September, 1925. It was found on the roadside here in the day, at an elevation of about 7,000 feet. It was rather active when first seen, easily springing on to its feet when turned over on its back ; but it did not live long. It was dead the morning after it was captured. I remember catching many of these Water-bugs at Asansol where they were generally attracted by bright lights. The bite is said to be painful and poisonous, but I have fortunately never been bitten. Though widely distributed in India I can trace no record of the occurrence of the Giant Water-Bug in the N.W. Himalayas at this altitude. I find, however, that Mr. E. A. D'Abreu obtained a specimen on 9th June, 1910, at a height of 6,000 feet in the Eastern Himalayas. As he had never seen it at that altitude before and thought the fact worthy of record, I send you this note as also being worth recording in the Journal.

S. BASIL-EDWARDES,
M.B.O.U.

SIMLA,
23rd September, 1925.

PROCEEDINGS

Proceedings of the meeting held on March 9, 1926

The Annual General Meeting of the Members of the Bombay Natural History Society was held in the Board Room of the Prince of Wales' Museum on March 9 at 6 p.m. His Excellency the Right Hon'ble Sir Leslie Wilson, P.C., G.C.I.E., C.M.G., D.S.O., the Governor of Bombay, presiding.

It was announced that the following 75 new members had been elected since the last meeting :—Mr. C. A. Latif, Bombay ; Major J. M. W. O'Rorke, Sialkot ; Capt. R. G. Hogg, Quetta ; Mr. D. Pilditch, Benares ; Mr. G. F. Coulton, England ; Mr. A. E. Bassett, Rampur Hat, E. I. Ry. ; Mr. I. L. Cameron, Ceylon ; The Honorary Secretary, Wellington Gymkhana Club, Wellington, Nilgiris ; Mr. T. V. Ramakrishna Aiyar, B.A., F.Z.S., Coimbatore; H. H. Raja Lakshman Sen, Sundarnagar, Sukhet State, Punjab ; Major H. J. D. O'Neill, Quetta ; Mr. C. B. Chartres, M.L.A., Calcutta ; Mr. P. O. R. Bally, Bombay ; Major W. E. Jones, Bombay ; Mr. R. C. Blackwood, Shillong, Assam ; The Honorary Secretary, Mawlaik Club, Mawlaik, Upper Chindwin, Burma ; Mr. R. M. C. Thursfield, Rangoon ; Mr. R. K. Anderson, Thayetmyo, Burma; The Government Entomologist, Mandalay, Burma ; Mr. D. W. Lawson, Mandalay, Burma; Rev. F. S. Briggs, Peshawar; Mr. A. H. L. Leach, Rangoon; Capt. J. McClive, Nowshera, N. W. F. P. ; The Director of the Deutsches Entomologisches Institute der Kaiser-Wilhelm-Gesellschaft, Berlin-Dahlem, Gosslerstrasse, 20 ; Lt.-Col. A. Forest Harper, Bombay ; Capt. G. H. Chambers, Jubbulpore, C. P. ; The Chief Librarian, Public Library, Museums and National Gallery of Victoria, Melbourne, Australia ; Mr. David Ezra, Calcutta ; The President, Forest Research Institute and College, Dehra Dun, U. P. ; Mr. H. A. Fooks, Calcutta ; Maharaj Shri Bijey Singhji Bahadur of Bikaner, Rajputana ; Mr. C. Lakshminarayanan, Madras ; Mr. G. D. Owen, Mercara, Coorg ; Mr. A. Mac Dougall, Bombay ; Mr. F. C. B. Cruickshank, I. C. S., Almora, U. P. ; Capt. A. L. O. Burke, Ambala, Punjab ; Mr. E. D. Treneer-Michell, Peshawar, N. W. F. P. ; Mr. Ajit Nath Dass, M. R. A. S., F. Z. S., Calcutta ; Capt. J. McL. Short, Nowshera, N. W. F. P. ; Mr. D. S. Laud, Byculla, Bombay ; Col. Theodore Roosevelt, New York ; Mr. Kermit Roosevelt, New York, U. S. A. ; Mr. H. D. Chaldecott, Kollengode P. O., *via* Palghat ; Mr. H. A. Boas, Kollengode P.O., *via* Palghat ; Capt. B. Shah, I.M.S., Karwar ; Mr. P. E. Percival, C.I.E., I.C.S., Bombay ; Capt. E. Percival, Bombay ; Mr. G. S. Rajadhyaksha, I.C.S., Satara ; H. H. Nawab Hussain Yavarkhan Jafar Alikhan Sahib Bahadur, Cambay ; Mr. A. F. W. Dixon, Koraput, Vizagapatam Dist. ; Mr. W. Smith Rollo, Mandalay, Burma ; The Principal, Agricultural College, Mandalay, Burma ; Mr. Wm. Angus Muir, Esq., M. A., M.C., I.F.S., Bombay ; The Honorary Secretary, Mercara Book Club, Mercara, Coorg ; Mr. Dharamsey Mulraj Khatau, Bombay ; Mons. Pierre Jabouille, Annam, Indo-China ; Dr. J. J. Modi, B. A., Ph. D., C.I.E., Bombay ; Major S. R. Shirley, M.C., Delhi ; Major R. N. G. Scott, Delhi ; Mr. J. W. Dix, Mohammerah ; Mr. R. J. Jackson, Bushire, Persian Gulf ; Dr. V. E. Whitman, Mohammerah, Persian Gulf ; Mr. G. Hotz, Agra ; Dr. Ekendra Nath Ghosh, M.Sc., M.D., F.Z.S., F.R.M.S., Calcutta ; Major J. Morison, I.M.S., Bombay ; The Mess President, 1st Royal Battln., 9th Jat Regt., Fyzabad, U.P. ; Mr. John Coode, I.F.S., Ootacamund, Nilgiris ; Mr. A. W. P. Millard, Bombay ; Mr. T. J. Mackenzie, Indore ; The Mess President, 1st Battln. The Gordon Highlanders, Trimulgherry, Deccan ; Miss Mozelle, M.A., B.Sc., Dombivli ; Capt. W. A. Whitehead, Nowshera ; Mr. P. J. Barrand, F.Z.S., F.E.S., Kasauli ; The Mess President, 2/1st Gurkha Rifles, Razmak ; The Mess President, 1/16th Punjab Regt., Jhelum.

Officers for 1926

The following were unanimously elected members of the Managing Committee for the ensuing year :—

President.—His Excellency the Right Hon'ble Lt.-Col. Sir Leslie Wilson, P.C., G.C.I.E, C.M.G., D.S.O.

Vice-Presidents.—The Hon'ble Sir Norman Macleod, Kt.; His Highness The Maharao of Cutch, G.C.S.I., G.C.I.E.; and Rev. Father E. Blatter, S.J., Ph.D., F.L.S.

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HONORARY TREASURER'S REPORT ON THE ACCOUNTS FOR 1925

' Excluding special donations received from the Nepal Government and Her Highness the Maharani of Dhar, the total income of the Society in 1925 was Rs. 43,377-14-9 whilst the expenditure was Rs. 44,081-14-9 and in addition we owe Rs. 4,000 on Journal Account and in respect of monies received from the sale of Mr. Stuart Baker's *Pigeon Book.* Once again therefore we have failed to make both ends meet.

In 1924 we spent on the Journals issued during that year Rs. 13,984-5-4 and closed the year with an outstanding of Rs. 4,368-8-0 on the Journal account. In 1925 we spent on the Journals issued during that year Rs. 12,598-0-0 and closed with Rs. 3,500-0-0 owing on the Journal account. There has therefore been a decrease of Rs. 2,254-13-4 in connection with expenditure on the Journal in 1925. Sales of Journals increased by Rs. 700 over 1924. In 1925 we had to pay Rs. 3,000-0-0 to the publishers of our Game Books and only received Rs. 2,000-0-0 and in connection with the Pigeon Book we paid Rs. 1,150-0-0 representing sales in previous years and similarly Rs. 240-0-0 on account of Iraq Fauna.

We had to face increased salaries amounting to Rs. 1,500-0-0 and we shall have to face still further increases but we have a good staff and a staff which is devoted to the interests of the Society.

I am glad to say receipts from Taxidermy increased by Rs. 800-0-0, showing that the work done by the Society is appreciated by members, but it is very difficult to say what financial profit—if any—is being made at present. We should make a profit if we had more accommodation and more work.

Part of the contribution received from the Government of Nepal has already been spent in connection with the work on the *Fauna of Nepal* produced by Mr. Prater, and which was the main reason for the donation. The whole of these special donations will be spent on special objects and the money cannot be considered as part of the ordinary income of the Society.

During 1924 our membership totalled 1283, 87 having joined and 93 having died or resigned. During 1925 our membership was only 1,208, a decrease of 75; 88 joined while 137 (a particularly large number) died or resigned. These losses must be made good and it behoves each member to try and rope in at least one new member, and having caught one, to make him buy a set of the *Game Books.*

During the year we sold 21 sets of *Game Books*, but we still have 457 copies of vol. i and 398 copies of vol. ii, in addition to about 450 unbound sets. At the present rate of sales we have sufficient stock to last us about 40 years. £840 or about Rs. 11,200-0-0 are still due to the publishers I regret to say. In the accounts the value of these *Game Books* has not been taken into consideration, but a conservative estimate would fix it at 50 per cent more than that still due to the publishers.

I should like to record my thanks to Mr. J. D. Lewis who since last April has been working for me as Honorary Treasurer.'

Sir Reginald Spence, the Honorary Secretary then read the Report of the Society for the year ending December 31, 1925, which is published on pages 196-205 of the Number. H. E. The Governor then addressed the meeting, a full account of H.E.'s speech is printed in the Editorial Note of the present Journal.

The meeting closed with a vote of thanks to His Excellency proposed by Sir Norman Macleod, Kt., Vice-President of the Society.

BOMBAY NATURAL HISTORY SOCIETY

STATEMENT OF ACCOUNTS from January 1, 1925 to December 31, 1925

RECEIPTS	RS A P	RS A P
By OPENING BALANCE ON JANUARY 1, 1925—		
Amount transferred in Mammal Fund ...	1,000 0 0	
Balance on current account with National Bank of India, Bombay	2,735 5 7	
Cash on hand	150 0 0	
Balance on Current Account with National Bank of India, London, £178-11-7 at 1/6.	2,381 0 10	
Amount due by the Staff	357 4 0	
		6,623 10 5
,, Collection of Subscription in arrears ...	270 0 0	
,, Collection of Subscription for current year	24,573 14 0	
,, Collection of Subscription in advance ...	2,425 0 0	
	27,268 14 0	
Less refund of Subscription	81 8 0	
		27,187 6 0
,, Life Membership Subscriptions	1,050 0 0	
,, Entrance Fees	1,400 0 0	
,, Interest on Investments	3,835 15 10	
		6,285 15 10
,, Registration Fees	361 8 0	
,, Sales of Journals	3,387 7 4	
,, Receipts from advertisement in Journals...	168 12 0	
		3,917 11 4
,, Sales of Snake Charts	268 11 0	
,, ,, Game Books	2,031 8 0	
,, ,, Pigeon and Doves Books ...	150 0 0	
,, ,, Other Printed Matters	125 8 0	
,, ,, Hand-list of Birds	87 0 0	
,, ,, Iraq Fauna	30 0 0	
,, ,, Plates	59 0 0	
		2,751 11 0
,, Receipts for mounting specimens and other charges	810 1 0	
,, Sundries	207 11 10	
		1,017 12 10
,, Amount received from Mammal Fund ...	...	2,197 9 9
,, Donation from Nepal Government ...	...	5,000 0 0
,, ,, H. H. Maharani Sahib of Dhar	...	5,000 0 0
,, Amount recovered from the Staff ...	...	19 12 0
Total ...	...	60,001 9 2

PAYMENTS	RS A P	RS A P
To Journal Account	15,881 7 6	
,, Salaries	16,219 14 8	
,, General Charges	1,653 11 8	
,, Rent	3,257 4 0	
,, Printing and Stationery	476 2 10	
,, Postage	1,219 5 0	
,, Library Account	440 1 9	
,, Furniture	107 0 0	
,, Audit Fee	250 0 0	
,, Fire Insurance Premium...	187 8 0	
,, Messrs. Bale Sons and Danielson account Game Books	3,000 0 0	
,, Messrs. H. F. G. Whitherby for Pigeons and Doves Book sold in 1924	1,150 0 0	
,, Messrs. The Times of Baghdad for Iraq Fauna sold in 1924	239 7 4	44,081 14 9
,, Fixed Deposits with National Bank of India, Ltd., and Netherlands Trading Society	10,000 0 0	
,, Balance with National Bank of India, Bombay	3,479 8 3	
,, Cash on hand	150 0 0	
,, Amount with the Staff	357 4 0	
,, Balance on Current Account with National Bank of India, London, £144-19-4 at 1/6.	1,932 14 2	15,919 10 5
		60.001 9 2
Securities with the National Bank of India, Ltd., Bombay		
3½% Government of India, Pro-Note	8,800 0 0	
4 % ,, ,, Conversion Loan...	10,000 0 0	
4 % Bombay Port Trust (ungtd.) Bonds ...	14,000 0 0	
4 % City of Bombay Impt. Trust Bonds ...	15,000 0 0	
6½% Bombay Development Loan 1925 Pro-Notes	8,000 0 0	
5 % Loan 1945/55	10,000 0 0	
Total ...	65,800 0 0	

We have seen a letter from the National Bank of India, Ltd., Bombay, to the effect that the above Securities were held on the Society's behalf on December 31, 1925; also a certificate from the National Bank of India, Ltd., London, for the balance with them.

BOMBAY, *February 22, 1926.*
Examined and found correct.
A. F. FERGUSON & CO.,
Chartered Accountants, Auditors.

G. F. J. CUMBERLEGE,
Honorary Treasurer,
Bombay Natural History Society.

A. F. FERGUSON & CO,
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JOURNAL

OF THE

BOMBAY NATURAL HISTORY SOCIETY.

EDITED BY

SIR REGINALD SPENCE, KT., F.Z.S., and S. H. PRATER, C.M.Z.S.

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SEP 7 1927
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SMITHSONIAN INSTITUTION
SEP 7 1927
NATIONAL MUSEUM

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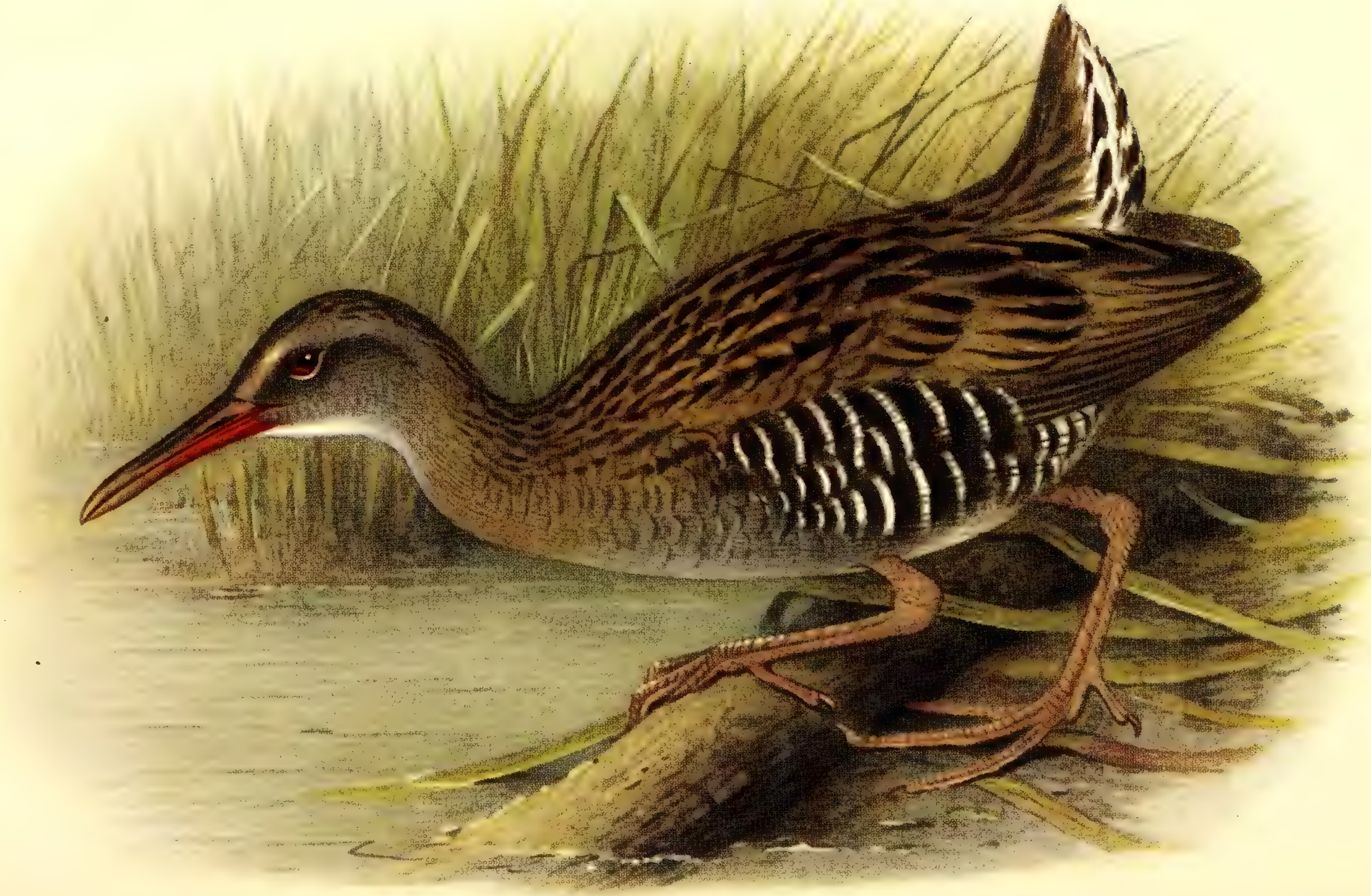


THE INDIAN WATER RAIL

Rallus aquaticus indicus

$\frac{2}{3}$ life size

JOURNAL
OF THE
Bombay Natural History Society

August, 1926 Vol. XXXI No. 2

THE GAME BIRDS OF THE INDIAN EMPIRE

BY

E. C. Stuart Baker, F.Z.S., F.L.S., M.B.O.U., C.F.A.O.U.

Vol. V

THE WADERS AND OTHER SEMI-SPORTING BIRDS

Part I

(*With a coloured Plate*)

I have been asked by the editors of the Bombay Natural History Society to bring out in their journal a series of articles on the waders and other semi-sporting birds of India which will eventually take a place as the final volume of our work on *The Game Birds of the Indian Empire.* Hume and Marshall, in their magnificent work on the game birds, fully realized that every man, when he went out shooting small game, was constantly killing birds which to him seemed to be, to all intents and purposes, game birds, although not coming within the usual acceptance of this term. They accordingly arranged a part volume to include such birds and we propose to do the same.

Possibly there is no country in the world in which the sportsman meets such an extraordinary wealth of birds as he does in India and China coming so near the border line of game birds. Many of these birds are excellent for food and are amongst the wariest and hardest of birds to approach or to bring to bag. Thus anyone who has spent the day after the Demoiselle Crane, whether successful or not, will never grudge this magnificent bird a high place amongst our Indian game birds. Amongst the vast number of birds generally known as Snippets or 'Kuch-nahin' there are many, such as the Godwit and others, which are almost equally deserving of such a place, for even if not so difficult to approach, they afford good shots on the wing and are not to be despised when on the table. Again, every one who goes Snipe shooting must have once or more shot birds which as they rose, he imagined for the moment to have been Quail but which when picked up proved to be merely one of the small Rails.

Our editors therefore consider that it would be advisable to produce a volume by which the sportsman may be able to identify the hundred and one birds which he may by chance or design or even by mistake, bring to bag in the course of a day's shooting.

Roughly speaking these birds embrace the Cranes and Storks and the Rails and Waders, the latter belonging to the big family *Charadriidœ* which also embrace the really game Plovers, such as the Golden and the Grey.

The number of birds to be dealt with will of course be very large and it is accepted that such a volume will be one required more by the sportsman pure and simple, than by the field naturalist or scientist. It is therefore proposed to eliminate from this volume all synonymy beyond the first reference to the scientific names quoted. Again, in dealing with each bird, each species will be treated as a whole and only a brief reference made to those subspecies or geographical races into which the species may be divided. As regards field notes and, whenever possible, sporting yarns, these will be given in full as also will be breeding notes in so far as these are available.

For illustrations an endeavour will be made to select those species of birds for delineation which most often come in the way of the shooter. For the others, the reader will have to rely on the descriptions given.

RALLUS AQUATICUS

The Water Rail

Three races of the Water Rail have been recorded as occurring in India. These three are

1. *Rallus aquaticus aquaticus.* The Water Rail.

Rallus aquaticus Linn., Syst. Nat., Ed. 10, p. 153, 1758 (Great Britain).

2. *Rallus aquaticus indicus.* The Indian Water Rail.

Rallus indicus Blyth, J. A. S. B., xviii, p. 820, 1840 (Bengal).

3. *Rallus aquaticus korejewi.* The Turkestan Water Rail.

Rallus aquaticus korejewi Sarudny, Orn. Monatsb., p. 209, 1905 (E. Turkestan).

RALLUS AQUATICUS INDICUS

The Indian Water Rail

Description: Forehead, crown and nape black with rufescent olive-brown margins; supercilium from the forehead to above the earcoverts white above the lores, ashy posteriorly; lores and a line through the eye dark ashy-brown; upper plumage, scapulars, inner secondaries and tail black with broad olive-brown edges; lesser and median wingcoverts olive-brown, with traces of white bars and tips; greater and primary coverts olive-brown, sometimes with faint traces of white bars, sometimes with none at all; quills brown; cheeks and sides of head ashy-grey; chin and throat nearly white; foreneck, breast and abdomen ashy marked with brown; flanks, vent and lower abdomen black or blackish-brown, barred with white; under tail-coverts black edged with rufescent white.

Colours of soft parts: Iris red-brown to brick-red; bill, upper mandible dark brown with a stripe on the base bright orange-red to vermillion; base of lower mandible also red but rather paler, the terminal third grey to dark horny-brown; legs and feet, fleshy brown to pink or browny-pink.

Measurements: Wing ♂ 120 to 136 mm.; ♀ 110 to 126 mm.; tail 52 to 65 mm.; culmen ♂ about 40 to 43 mm.; ♀ about 36 to 40 mm.; tarsus about 40 to 45 mm. The Turkestan Water Rail is the largest of the three forms, the wing being nearly always over 126 mm., whilst the English Water Rail seldom has it over 130 mm.

Chick in down. Velvety black all over.

Young birds have broader pale rufescent edges to the lower plumage and are much more definitely barred with white on the wing-coverts.

Distribution: Burma, Assam and Eastern Bengal. Nowhere else in India.

RALLUS AQUATICUS KOREJEWI is close to *R. a. aquaticus* but is lighter above and also a paler grey below.

Distribution: Extends to N. W. India, South Sind and to Sehore, Central Provinces. A Sind bird in the British Museum labelled *indicus* is certainly *korejewi.*

RALLUS AQUATICUS AQUATICUS differs from our Indian bird in having the whole of the breast, etc., a much darker, purer grey; the sides of the head are practically all dark-grey and there are only faint indications, if any, of the pale supercilium; the chin is almost as dark a grey as the throat and breast.

Young birds freshly mounted have pale rufescent edges to the feathers of the breast and lower parts but they are never sufficiently conspicuous to make these parts like those of the Indian Water Rail. No specimens have been obtained in India.

In India the true English Water Rail does not occur but we have two geographical representatives which only differ from it as shown above in a very small degree. Of these, *R. a. korejewi* breeds in the North-West Himalayas from the Afghan territory throughout Kashmir to the lakes in West and South-West Tibet. The other is the race *R. a. indicus* which breeds in North-East Siberia and Japan but which finds its way in winter to Burma, Assam and Eastern Bengal but, so far as is known at present, to no other portion of the Indian Empire.

The inclusion of the Common Water Rail within the limits of the Indian Empire rests upon two specimens obtained by Dr. King and Dr. Adams in the Dun, and a single specimen obtained near

Abbotabad, all of which, however, belong to the slightly paler form found in Turkestan. Those birds also which have been found breeding in Kashmir are of the same race and the British Museum does not possess a single specimen which can really be allocated to the European race.

Nidification : The Water Rails breed either in, or very close to, marshes, occasionally, however, in damp meadows and in ditches or similar places at a considerable distance from water. The nests are almost invariably very well concealed, being placed well in amongst herbages of some kind, such as long rank grass, beds of weeds, in amongst long reeds growing in water, or in amongst, or indeed often under, masses of debris which have collected on the sides of ditches or other places. The nest itself is very loosely put together, a bed of dry rushes, aquatic weeds and grass without any true lining, though the inner portion may be made with somewhat softer and more pliant material than the outer. Sometimes nests are a considerable size, measuring as much as a foot across by about six inches deep. The majority, however, are little more than half these dimensions with an internal rough cup of about 5 in. × 3 in. deep. The hen bird, which apparently does most of the sitting, is very hard to catch on the nest, as she sneaks off very quietly on the approach of any person or animal, creeping through the grass and weeds and not rising until some distance from her nest, if at all. In Europe the Water Rail breeds principally in May and early June, and the Japanese bird also breeds principally in those months. The Kashmir bird, however, is rather later, not starting to breed until the end of May whilst a few do not do so until July. The number of eggs laid varies considerably. In Europe seven or eight eggs forms the usual clutch, though I have known as many as twelve and have heard of fourteen. In Eastern Siberia and Japan, seven or eight seems to be the greatest number ever laid, and Allan Owston informed me that he had known as few as three or four eggs incubated. Of Indian records there are but few. Ward obtained it in Kashmir and also in Ladakh. Osmaston has succeeded in taking a certain number of nests in Kashmir and, according to these ornithologists, five to seven seems to be the normal full clutch.

I do not think that the eggs of the various races can be distinguished from one another, but undoubtedly as a whole, eggs laid by the Japanese race are very much richer in colour than are those laid by the two other forms, although individual eggs of any one of these three can be matched with others of the other two.

The ground colour varies from a pale buff to a pale grey-green; a very few eggs have a distinct reddish tinge whilst in a few others it might almost be called a blue-grey. The marking consists primarily of spots and blotches of dark reddish-brown, a few almost purple-black in colour and a few rather washed out and paler reddish in tint. These are sparsely scattered over the whole egg and are sometimes more numerous at the larger end where they may form a very indefinite ring or cap. The secondary, or underlying spots, are rather more numerous and in colour are a pale neutral tint of orange-grey.

Witherby gives the average of 90 eggs of the European race as 35.44 × 25.75 mm.; maxima, 39 × 25.5 mm. and 35 × 27.3 mm.; minima, 31.9 × 25 mm. and 36.8 × 24.1 mm.

Habits: The habits of the Water Rails, to whichever race they belong, are much the same. They are all inveterate skulkers and for this reason appear to be a great deal more rare than probably they really are, and it is possible that if one knew where to look for them and how to make them show themselves, they might be found comparatively common in Kashmir, Ladakh and Eastern Tibet. Without dogs, however, it is extremely difficult to flush them. They are certainly most often to be found within a very short distance of some swamp or lake but occasionally they wander away into grass fields and crops at a considerable distance from any piece of water. When disturbed they run at a very great pace, their tail depressed but the head held even lower than the tail. When, however, they think that they are unobserved they strut about very much as a Moorhen does, their head held erect and their tail in the same position. They have a curious little habit when thus moving about, of constantly flicking their tails up and down in little single jerks repeated for two or three minutes. Considering the size of their wings they are quite good fliers as one would indeed suppose them to be considering the distance some of the forms migrate in winter. Thus individuals of the sub-species *R. a. indicus* must in many instances make a return journey from their Northern breeding homes to India and back, of many thousands of miles, crossing great ranges of mountains and wide rivers *en route*. Our Kashmir form *R. a. korejewi* does not seem to be nearly so migratory in its habits as the last bird or as our European bird *R. a. aquaticus*. It is probable that none of the migrating birds travel very great distances in consecutive hours but it has been noticed that both Burmese and Chinese birds sometimes arrive at their destinations in a state of very great exhaustion. Indeed, one of the few birds which I have personally seen in India was so weak that it allowed me to take it up without making any attempt to escape.

The ordinary call note of this little Rail is a softly repeated 'Chip-chip-chip,' but in the breeding season it has a very loud shrill call which Witherby describes as 'a loud, piercing and explosive scream'. It also utters during the breeding season a low grunting note, whilst both birds, whilst at the nest, emit a sound which Mrs. Turner calls a soft purring note. They are excellent swimmers and almost equally good divers but for the most part their food is obtained in the shallow waters where diving is not very necessary. Their food is very varied and consists of any small fish which they can catch, crustacea and mollusca, many insects and larvæ, in addition to all of which they are said to consume a considerable amount of vegetable matter. Seeds of many plants and oak galls have been found in their crops. They feed to a great extent on land as well as in water and on the rare occasion one gets a sight of them, they may be seen feeding indifferently upon either seed or insects as they come across them. A very popular article of diet with these little birds are young half-grown grasshoppers as well as fully adult ones and I have seen them hopping up into the air to catch these latter as they take to flight when disturbed from the grass.

They are not one of the birds which find their way into the mixed bags so often made in India, especially by those who have recently landed in the country; nor can they claim any status among the Game Birds either from the difficulty they present for a shot or on account of their qualities for the table. At the same time they are birds about which we still have much to learn and concerning which field records are desiderata.

(To be continued)

SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY NO. XLVI

BY

HELEN M. LINDSAY, M.A., B.SC.

FURTHER EXAMINATION OF SINGHALESE SPECIES OF *Funambulus* AND DESCRIPTION OF THE NEW SUB-SPECIES, *F. p. matugamensis*.

From Ceylon the Indian Mammal Survey obtained 152 specimens of *Funambulus palmarum* which were classified by Mr. Wroughton and Miss Ryley. Later, in 1915 Mr. Thomas and Mr. Wroughton published a paper 'On Singhalese species of Funambulus' J.B.N.H.S., vol. xxiv, No. 1, in which they give a key to the species and divide *Funambulus palmarum* into five distinct sub-species :—

(1) *Funambulus palmarum palmarum*
(2) ,, ,, *favonicus*
(3) ,, ,, *kelaarti*
(4) ,, ,, *brodiei*
(5) ,, ,, *olympius*

mainly on considerations of differences in colour and in habitat. They also state that true *Funambulus palmarum* does not occur in Ceylon.

Recently three new sets of material have been received from Ceylon and further investigation has thus been made possible. The Colombo Museum has sent ninety specimens representing all the nine provinces into which Ceylon is divided : Mr. W. W. A. Phillips has presented to the British Museum a set of twenty-one specimens and has also sent another lot of twenty-eight specimens from his own estate, making a total of 139. In the British Museum stock was found an old specimen, presented in 1866 by Viscount Walden and labelled *'S. tristriatus'*, which on detailed examination of its skull and skin must now be included in the new collections. In characteristics and habitat these 140 specimens on the whole bear out the division made by Mr. Thomas and Mr. Wroughton, but in addition they also disclose the presence of true *palmarum,* as shown in three specimens obtained on low ground in the east of the North Central Province.

A NEW SUB-SPECIES CALLED *Funambulus palmarum matugamensis.*

These collections show too that 18 specimens from Matugama in the West Province, about 30 miles south-east of Colombo, differ so much in colour and measurement of skin and character of skull that they must form a new sub-species to which I have given the name *Funambulus palmarum matugamensis.* Of these eighteen, Mr. Phillips has sent twelve, while five came from Colombo Museum and the old one from the British Museum collections.

This new sub-species comes closest in size to *F. p. favonicus.* Thus the average measurements of seven adult specimens give

Head and Body : 144′ 7 (143) ; Tail : 138 (144) ; Hind foot : 35 (33) ; Ear : 17 (16). SKULL :—Greatest length : 38′ 7 (38) ; nasals : 11 (12) ; zygomatic breadth : 21 (22) ; interorbital breadth : 11 (11). A cleaned skull of this new sub-species shows :—Greatest length 38 (38) ; condylobasilar length : 32 (31) ; nasals : 11 (12) ; zygomatic breadth : 21 (22) ; basilar length : 30 (30) ; palatilar length : 16 (16′ 5) ; interorbital breadth : 11′ 5 (11′ 5) ; upper tooth row : 7 (7′ 5).

The figures in brackets are the measurements of the type of *F. p. favonicus.*

But in colour there is much less resemblance. These eighteen specimens are dark as *F. p. olympius,* the saddle being almost black but the three sub-equal dorsal stripes are here all the same colour of tawny or tawny ochraceous, and ⅛″ to ¼″ in breadth. The under parts are ochraceous buff or woodbrown, almost isabelline in some specimens. The tail is somewhat bushy and is orange-rufous below, thus resembling that of *F. p. brodiei.* The neck and shoulders are olive, while the flanks are woodbrown. The face is as a rule coloured like the neck but in winter pelage gets a reddish tinge. The feet are dark as in *F. p. olympius,* The shape of the skull in this sub-species differs from that of the others in the prominence of the olfactory lobes and the size and shape of the nasals, also in the distance between the point of junction of these lobes and the point of junction of the nasals. In this sub-species the measurement between these two points is 4 mm. while in *F. p. favonicus* it is 5 mm.; in *F. p. olympius* 6 mm. and in *F. p. kelaarti* from 4′ 5 to 5 mm. Examination of the collection as a whole shows that the shape of the nasals in the different sub-species is fairly constant :—e.g., the posterior edge of the nasals in *F. p. favonicus* is deeply and sharply serrate : that of *F. p. kelaarti* is also pointed but not so deeply serrate and the nasals terminate practically in a line with the frontopremaxillary suture, while that of *F. p. olympius* is of rounded shape almost oval, and ends well in front of the suture.

In classifying these 140 specimens reliance has been placed mainly on the characters of the skull and on the locality whence they were obtained since the variability of colour of coat and size in any one species is considerable, depending on the season and nature of the habitat. This new sub-species comes from a tract of country 100 feet above sea-level in one of the moistest areas of Ceylon with an average rainfall of over 150″. Rubber and cocoa palms are grown there and there is much low scrub and jungle around the estates. *F. p. matugamensis* may be found therefore to be a localized form of *F. p. palmarum* just as *F. p. olympius* has been confined to the high hills, and *F. p. favonicus* to the submontane regions.

The classification of these specimens resulted in finding *F. p. olympius* 48; *F. p. favonicus* 28; *F. p. kelaarti* 22; *F. p. brodiei* 10; *F. p. matugamensis* 18. The remaining specimens could not be determined as skull or labels were amissing. There were 3 albino juvenile specimens, one of which had a skull resembling *F. p. favonicus* but as there was no label it cannot be named.

THE MASON WASP (*EUMENES CONICA*)

BY

MAJOR R. W. G. HINGSTON, I.M.S.

PART I

ARCHITECTURE

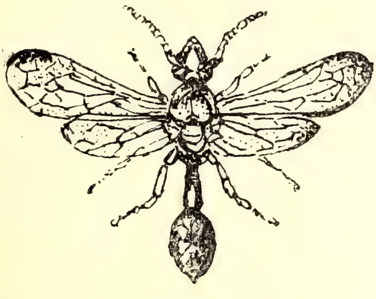
(*With a plate and text figures*)

This is the narrative of a mason wasp, the common species *Eumenes conica,* which I shall speak of as the cone-shaped *Eumenes.*

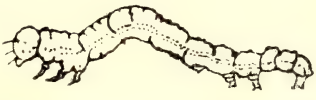
This wasp enjoys a wide distribution. It is found in all parts of the Indian Peninsula, crosses over into Ceylon, spreads east to the Burmese plains. From there it extends north to Chinese territory and south into the regions of Malay.

We are concerned with the female only. She is the architect. Her mate in comparison is puny and insignificant. He does no work. His business is to frolic in the tropical sun, to follow the mere dalliance of life. Certainly he performs the bare functions of his sex; but everything concerned with the architectural instinct, the skill, the industry, the intelligent toil, are the attributes of the female alone.

First a note on her appearance. Strong and powerful, a triangular head with incurved jaws, a square-shaped thorax, a thread-like waist, an abdomen swollen into an elongated pear: these are her most striking points. Dark-red in colour. On the front of her head is a patch of yellow, a few black bars cross her abdomen, a delicate purplish gloss tips her golden wings. She is smooth and clean and shining without a trace of any fur.



Eumanes conica



NOCTUID LARVA EXTRACTED FROM A MUD CELL OF *Eumanes conica*

In character bold and intrusive, she enters courageously into any apartment likely to supply her needs. Associated with this daring is some suspicion. If aware of any prying interference, she quickly deserts her home. Her habits are solitary in the strictest sense. She is powerfully armed with sting and poison, not, however, supplied for protection, but in order to paralyze her prey.

I pass to architectural operations.

She constructs a cell composed of mud, building it in the shape of a dome. At the summit she leaves a circular aperture. This serves the purpose of a door. When the cell is built and the door still open she introduces an egg. Then she goes off to search for caterpillars. These she paralyses, then carries to the edifice, then pushes through the door. This is the provender necessary for her larva. She brings sufficient to fill the compartment, then closes the aperture with clay. The first cell is now complete; but no sooner has she finished one than she commences to build the next. Each cell is placed so as to touch an adjoining cell; consequently there results a cluster of neat little oval domes. She then covers the whole with mud until it looks like a shapeless cake. There are thus five architectural stages. First the raising of the dome, second the laying of the egg, third the introduction of the provender, fourth the closing of the gate. These four successive steps enter the construction of each separate cell. The fifth stage concerns the cell combination. It is the final cover which the wasp applies over the whole.

This is the briefest outline of her operations. I come now to some detailed points.

Work begins in the middle of April, at least in this district of Fyzabad. A preliminary investigation marks its commencement. Exploring verandahs, entering rooms, the wasp examines each shady corner in her efforts to find an acceptable site. Particular attention is given to woodwork. Every object receives minute inspection. Only after prolonged and careful investigation will she content herself with some special place.

She shows definite preference for a wooden foundation, and thus frequently selects the furniture of a room. I have seen her build on a flat table, on the vertical sides of wooden boxes, on the leg of an easy chair. Other materials are not neglected. One wasp chose an iron hat-box, a second the surface of a glass pane, a third a leather trunk. She seems quite indifferent to direction in space. The nest on the table lay in the horizontal, that on the glass in the perpendicular direction, the one on the hat-box had curved foundations to suit the convex base. More attention is given to conditions of light. If possible she avoids bright surroundings, usually choosing some secluded corner liberally supplied with shade. For this reason, I think, she avoids white plaster. Her dislike is for the glaring colour of the lime-wash, not because she thinks the foundations insecure.

The site, being chosen, is minutely examined. It must be prepared for the reception of mud. If an even surface, no attention is necessary; but if of a rough or fibrous texture, we observe that she tears away the shreds, diligently employing every effort to make the area smooth. This is but a preliminary act. Nevertheless it has an end in view. This surface will later become the floor of her cell. Within the chamber her grub will develop. Its body will come in contact with the floor. Hence there must be no roughness or irregularity, nothing must be left that might injure the larva which is the object of all her toil.

Attend to her workmanship.

Here she comes. A vibrating hum denotes her arrival. In her jaws is a pellet of mud. First there is an aimless circle round the room; then, hesitating as though suspicious, she alights at the chosen spot. An antennary exploration is her next act. Apparently everything is satisfactory for she immediately proceeds to build. Carefully she lays her pellet on the site, then shapes it with her jaws into a low ridge about half an inch in length. On one side the ridge is vertical, on the other it shelves into a gentle slope towards what will later be the interior of the cell. This is the first stone in her edifice, a semi-liquid mud which very quickly dries into a solid brick. It takes her a minute to construct this ridge. When finished, she goes off. There is no delay. A second pellet is brought, applied to the first, spread out in the same manner so as to both lengthen and raise the ridge. More pellets follow. The ridge is extended, shaped into a curve, then bent round into an oval wall which becomes the substructure of the cell.

Architecture becomes now a systematic business. We watch her methodically coming and going. There is no haste, no hesitation. She works in an almost mechanical way. Often she flies direct to her edifice. At other times she alights a little distance away and from there goes on foot to her work. Watch her method. A position is taken on the wall. Her antennae are thrust into the oval where they investigate each step in the work. With hind and middle legs she holds the masonry, then begins to build. Her head is within, her abdomen curled round outside; she looks as if hanging to the edge of the wall. Her whole body is acutely bent; her wings, folded, erect and motionless, are kept well out of harm's way.

Now see the application of mud. With her fore tarsi she supports the pellet while her other legs grip the wall. Her mandibles knead out the mortar. They both spread it sideways into a layer and rake it up into an edge. Her antennae at the same time open and close, sensitive fingers measuring the ground and feeling the pellet being moulded into place. What a display of neatness and expedition! One or two minutes fixes the brick. A wait follows for perhaps a second, just a swift momentary survey. Then satisfied, she takes to her wings, disappearing with a noisy buzz.

She stays away a variable time. Her destination is the clayey patch where brick after brick is made. If the material is close at hand she is back in a minute; otherwise she may be absent more than twice that time. Occasionally she makes a prolonged interruption; I do not see her resume architecture until an hour has elapsed. The clay which she brings is of the finest material. It has been carefully selected and mixed with her saliva. Every particle of grit has been removed. Just sufficient moisture has been added to keep it in the spherical shape. Some species of

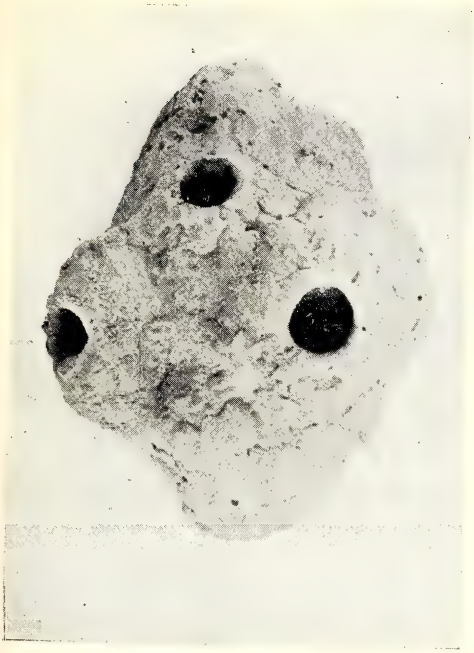
Eumenes insert pebbles in their masonry. The object of course is to strengthen the wall. But not so with the cone-shaped mason. She will have nothing but clay. Must she not have trouble in carrying this burden, a spherical globule of sticky mud about the size of an ordinary pea? Certainly if her jaws had not been specially adapted. But observe their suitability. They are long and curved and fit neatly round the pellet so as to enclose it in a ring.

I never caught her gathering clay. But her method must be the same as that of *E. dimidiatipennis,* an allied species that makes similar domes. From this latter I learn the necessary facts. These masons do not use ordinary mud; it is from the hardest and stoniest of available material that they make their architectural bricks. They seek it from the well-rolled thoroughfare, the solid road composed of limestone crushed and firmly driven in. There she fashions the viscid pellet, no doubt preferring powdery material because it can be made into more rigid clay. I see her alight on the open roadway. She digs into it, breaks it into dust, excavates a shallow depression into which she thrusts her head. In this hollow the globule is shaped. Her jaws gather up the finest dust; they thrust aside every granule except those of almost impalpable size. Her salivary glands pour out secretion. With this the dust is thoroughly impregnated until brought to the consistency of paste. Her jaws at the same time make it spherical; her antennae applied on either side examine and test its shape. A minute is sufficient for making the pellet. Then bringing forward her fore tarsi to support it, away she goes for the nest. Often she makes a circle or two around the area. This is a common habit of solitary wasps, a topographical performance, a visualization, a fixing of the spot in their memories with the intention of recognizing it again.

I return to the masonry. Pellet after pellet continues to arrive. For a quarter of an inch the wall is almost vertical. After this it begins to incline inward. The dome is coming into shape. She now builds so that each addition diminishes the oval. The wall curves in on every side. At length it appears to be complete except that it has a central hole. It is in fact a perforated dome.

Now follows an interesting performance. The central perforation is a true circle, in diameter one-quarter of an inch. Its edge is even. It is just a plain perforation in a cell.

This however will not suit the mason. She is not content with an ordinary hole. The time will come when she must plug this aperture. She must therefore have some special device in order to hold the stopper in place. For this purpose she constructs an everted rim all round the edge of the hole. Her last visit is devoted to this purpose. Again we observe her usual skill. Her tarsi hold her tightly to the turret as she lays this last pellet around the hole. She rotates upon the cupola, all the while drawing out her clay and smearing it along the edge. At the same time she neatly bends it outward so as to form an everted lip. What is the result? The opening is no longer a plain hole; rather it is shaped in the form of a funnel owing to the everted edge. What



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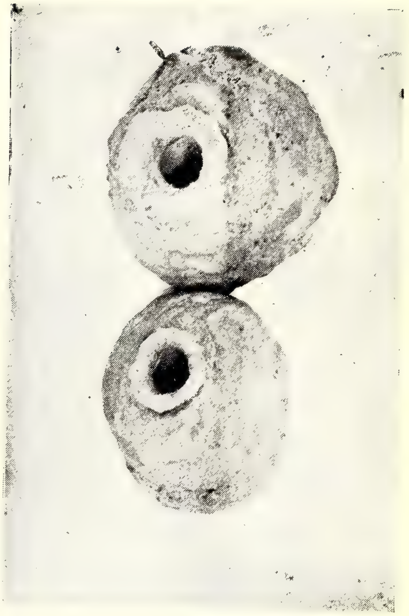

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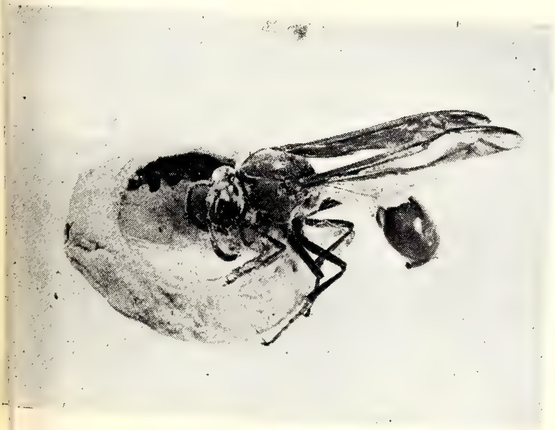

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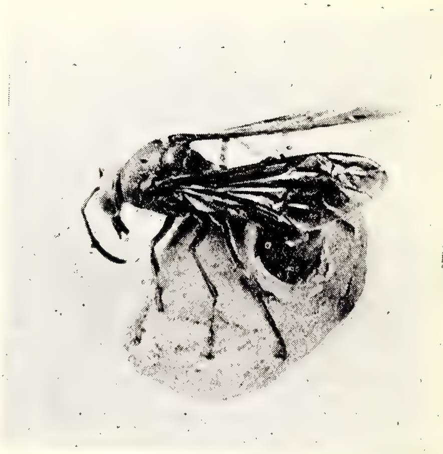


4

THE MASON WASP

1. Completed nest of *Eumenes conica* with apertures of exit made by young wasps.
2. Cells of *Eumenes conica*.
3. *Eumenes* engaged at building her wall.
4. *Eumenes* introducing her eggs.

suitable preparation for a later stage! It will be an easy matter to close the cell by just thrusting a pellet into the funnel, certainly a simpler mechanical operation than securing a plain hole.

The cell is finished. An inspection follows, the wasp thrusting her antennae into the pot. She soon withdraws them, sits for a little while on the summit, but does not attempt to leave. Perhaps she is about to enjoy a rest. She deserves a respite after all this work.

But no. The next step comes quickly, a fascinating incident. Suddenly a deep absorption overcomes her. She seems as if struck into a trance. Slowly she creeps forward to the summit of her dome, advances so as to sit across it with legs spread out on either side. Gently her abdomen goes into the aperture; her legs clutch the everted rim. Her head bows, her antennae droop, her graceful wings fall down along her back; there she clings, rigid as a statue, half without and half within her cell. Why is she thus mesmerized? What absorbs her? There is only one meaning for such behaviour. She is fulfilling the purpose of her labour, introducing an egg into the dome. Not a motion, not a sound accompanies the act. Even the antennae, so seldom motionless, now fall into a passive state. If we look closely to the base of the abdomen we may note a faint convulsive thrill. This is the effort at egg-expulsion, her only indication of life. For one or two minutes she remains thus fixed, immersed in the glow of that supreme ecstacy which accompanies the fulfilment of these vital acts.

The egg is layed. We can tell from outside that the act is over. For restlessness returns after its expulsion. The antennae begin gently to quiver before she withdraws her abdomen from the cell. Sometimes her head now enters the aperture. Perhaps she is anxious to see her egg. It may not be properly attached. At other times, however, she shows no curiosity. Her abdomen is withdrawn. Away she goes without a trace of any desire to inspect this vital object of her toil.

She does not waste a moment. Provisions must be obtained quickly. Is not her egg exposed to danger owing to the open gate? Away she goes amongst the gardens and trees. Untiringly she pursues her deadly quest. Her motion is a swinging and hovering in the air with the utterance of a gentle hum. Now she sways from point to point, now she poises for a moment to pry into some likely nook, then she sweeps off to some more distant field or alights to pursue her search upon the ground. The period of absence will depend on her success. At length she returns. Suspended beneath her is a large caterpillar. It is almost as much as she can manage since it has to be carried through the air. How well she supports it! Her jaws fix it round the neck; her legs are wrapped about its body, they also gather up its tail so that nothing projects behind.

Her next business is to stuff it in the cell. She thrusts its head first through the gate, then, seizing it further back, pushes it in a little more. Eight or ten similar pushes follow until the whole caterpillar is inside. When the caterpillar's tail disappears, the wasp presses it down with her jaws. Then another inspection;

again the antennae enter the aperture. How often have we had to describe this action; how clearly do we realize the antennary function of determining if all is well? The wasp, if dissatisfied with the manner of storage, again pushes in her head. Another round of adjustment follows, more pushing, more pressing, more testing with the tips of the antennae until the mason is finally satisfied that her provender is safely and economically housed.

More caterpillars are then brought. If of large size, four or five are sufficient. If small, she may require nine or more in order to fill the cell. She is independent of any special number. Capture after capture is pushed in until the edifice is crammed to the mouth.

The next business is to close the door. No difficulty is experienced here. She has already made it conical by constructing a lip. All that she need do now is to push a plug into the cone. She, therefore, brings a pellet, thrusts it in. As a rule one is sufficient. If not, she reinforces it by the addition of one or two more.

Eumenes amedei, as told by M. Fabre, makes use of a pebble for this purpose. She employs a stronger, a more specialized plug. Such is not the method of the cone-shaped mason. It is clearly impossible in this alluvial district. There is not a pebble for hundreds of miles in the plain of hardened mud. Animals must adapt themselves to the environment that offers. A pebble may be a much better kind of stopper, but this mason must build with what the country gives her. She can use but a plug of clay.

The work is finished. Let us take a glance at the completed pot. What a graceful tabernacle, oval in outline, built in the design of a dome! Scarcely an inch in the longest diameter; its width is about five-eighths and its height three-eighths of an inch. The interior is even and smooth. This is the surface of chief importance as against it the body of the larva will rest. Hence the mason has paid it minute attention. Her antennae have kept it under examination at all stages in the work. The external surface is comparatively unimportant; there the ridges and furrows are apparent which mark the superposition of the layers. The whole edifice is neatly formed, a charming example of earthen architecture, a perfect model of the potter's art.

The completion of one cell does not terminate her work. She must provide for many ova. Hence as soon as one cell is finished she immediately commences the next. The second is constructed alongside the first. Others are subsequently added, until about seven or eight are linked together in a group. The number of cells is very variable. Sometimes there may be ten in a cluster; at other times we find only two or three. Occasionally they may be placed in line. More often they seem to have no definite arrangement, being piled into an irregular mass.

I come to the last stage in construction, the cover of mud, the shield with which she envelops the whole. She does not wait till all chambers are built before commencing the manufacture of this shield. Frequently a few smears of mud are applied to it during the intervals between building cells. It is not made on an elaborate plan. Thick where needed to fill depressions, thin where the underlying architecture is raised, its purpose is just to even off irregularities and cover the surface in a uniform layer. Furthermore it adds strength to the edifice, also opposes an additional barrier against the invasion of parasitic foes. Unfortunately it destroys geometrical symmetry. The oval walls, the dome-shaped roofs, the varied points in geometrical architecture are all permanently concealed from view beneath a formless lump.

What a change! The nest no longer possesses attraction! It is now a mere flattened cake of mud that might have been just thoughtlessly thrown against the wall.

(*To be continued.*)

NOTES ON SOME NEW AND INTERESTING BUTTERFLIES FROM INDIA AND BURMA

BY

MAJOR-GENERAL H. C. TYTLER, C.B., C.M.G., C.I.E., D.S.O., F.E.S.

PART I

(*With one coloured and one black and white plate*)

INTRODUCTION

The butterflies from the extreme North-West of India are but little known ; Chitral has been worked by several collectors fairly thoroughly, and results have been published by Capt. (now Colonel) W. H. Evans, but the adjoining territories of Gilgit, Hunza-Nagar, Astor and Chilas, which are included in the Gilgit agency, and which are a mass of high and inaccessible mountains, have been practically untouched and very little is known of the butterflies that inhabit them.

In 1920 I proceeded on a shooting trip to Astor and availed myself of the opportunity to collect what butterflies I could in the short time at my disposal.

Through the kindness of Lieut.-Col. D. L. Lorimer, C.I.E., late Political Agent of Gilgit, I have received numerous specimens of butterflies collected by himself and by the local inhabitants in out of the way and inaccessible places of the Gilgit Agency, and but for his kindness and the trouble he has taken on my behalf, the material which has made it possible for me to write much of these notes would never have been obtained.

In 1924 I was transferred to Burma and did a certain amount of collecting at Maymyo and the Southern Shan States during the year I was there. Burma is most interesting entomologically and much work still remains to be done. Certain rich localities such as Thandaung are well known and have been worked thoroughly, but speaking generally most places have been but partially worked and some places on the Chinese and Siam borders are practically untouched, and other places, such as Putao on the extreme N.-E. of Burma, are quite unknown entomologically and a rich harvest awaits the first collector who is able to collect in Putao, the only part of Burma where snow-clad mountains occur to any extent.

At Maymyo I was fortunate to meet Mr. G. Cooper of the Survey of India who has done such good pioneer work in collecting in out of the way places and whose fine collection I was privileged to see. I am also indebted to him for the gift of many rare and interesting specimens.

In the spring of 1925 I proceeded to England on leave and was able to work out at the British Museum, South Kensington, the material I had accumulated and write my conclusions in these notes.

I take this opportunity to thank Capt. Riley of the British Museum for his invariable courtesy and ever ready help afforded me in working out my material but for which my task would have been rendered much more difficult.

1. *Troides ferrari*, n. sp.

The female differs from all other females of the yellow forms of *Troides* in the British Museum in the *different shape of the yellow patch* in the cell of the hind wing which is *oval* and extends from the apex to about ⅔ the length of the cell but does not touch and is well clear of the upper-discocellular. The yellow spot in interspace 6 is very small and narrow and adjoins v. 6 but not v. 7 ; the yellow spot in interspace 1 is as long as spot in cell ; the yellow spots in interspaces 2, 3, 4 and 5 are less than half the distance from the discocellulars to the outer margin; these are followed by large black spots entirely filling the interspaces and by small streaks on either side of the veins. Forewing black with veins very distinctly edged with grey.

Expanse: ♀ 174 mm.

Three females were caught by Lieut.-Col. Ferrar, C.I.E., Chief Commissioner of the Andamans, in the Great Nicobar Islands. It appears to be very close to *T. darsius*, ♀, from Ceylon but until the male is discovered its affinities cannot be determined.

The type is in my collection.

2. *Papilio noblei haynei*, sub-sp. n.

Bingham in his description of *P. noblei* says, ' Forewing with or without a quadrate white spot in the middle of interspaces 1 (a) and 1", and Frukstorfer in Seitz's work only mentions a form of *noblei* which has a white patch on the hind margin of the forewing and gives the distribution of *noblei* from Upper Burma to Tonkin. I do not know whether de Nicéville's type has a white spot on the forewing as I have not seen his original description and figure but had his type not had a white spot on the forewing I think Frukstorfer would have noticed it and given another name for the form with a white spot. I am unaware whether specimens with or without the white spot on the forewing occur together or not but a solitary specimen in the British Museum taken by Colonel Broughton at Ye' pank-kan, Southern Shan States, West of Pyinmana and a series from Tonkin in the Adam's collection all have the white spot on the forewing upper and underside; one specimen from Central Tonkin in my own collection in addition to the white spot on the forewing also has three yellow lunules on the hind wing. A series of *P. noblei* taken by Dr. Hayne near Myitkyina, North Burma, does not possess the white spot on the forewing either above or below and it would appear that in North Burma a race has developed without a white spot on forewing whilst further south a form with the white spot occurs. I propose calling the form from Myitkyina as above after Dr. Hayne who very kindly gave me two males from his series.

Expanse.—♂ 102 mm.

The type is in my collection.

3. *Paranticopsis xenocles phrontis*, de N.

A very curious melanitic ♂ of this species was taken by Mr. E. Ollenbach's collector in Sikkim. It is much darker than any ♀ I have ever seen.

The specimen is in my collection.

4. *Parnassius dongalaica*, sp. n. Pl. IV, Fig. 5, ♀

A single ♀ which may be a race of *P. mercurius*, Gr-Gr. from Amdo, N.E. Tibet was taken on the Donga-La, on the road to Mount Everest at 16,000'.

It differs from typical ♀♀ of *P. mercurius* in the British Museum collection in being much smaller and paler, and in having a well-marked series of white marginal and sub-marginal spots on both wings; at the base of the hindwing there is a large crimson spot which is wanting in all the ♂ and ♀ specimens in the British Museum.

In appearance it is somewhat like *P. epaphus everesti* Riley, but the keeled pouch at once separates it from that form and places it in the *Discobulus —Jacquemontii Mercurius* group.

The type is in my collection.

5. *Parnassius discobulus*, Alph:

The *discobulus—jacquemontii* forms occurring in Chitral and Gilgit are somewhat confusing and I find it difficult to place some of the forms under their correct names.

In Chitral and Gilgit there are five forms in which the females have keeled pouches; two of these fly together on the Shandur Pass; one of these is a large insect, 78 mm. in expanse with large red discal spots but no red spot at tornus, which I take to be *P. discobulus* Alph: or a race of it; and the other a much smaller and whiter insect, 60-64 mm. in expanse, in which the females have red tornal spots; I take this to be a race of *P. jacquemontii*. It is not *P. jacquemontii chitralensis* which is a different looking insect and flies much further south—in Shiski Kuh and Jhela Drosh—and has *all* the red spots very bright. I propose naming the Shandun-form of *P. jacquemontii*, *P. j. shandura* sub-sp. n.

Further North and in the extreme N. E. corner of Chitral on the Baroghil Pass leading into Wakhan, Afghanistan, another form of *P. discobulus* occurs which I propose calling *P. d. baroghila* sub-sp. n.

In Hunza the most easterly province of the Gilgit agency yet another *discobulus* form occurs which I propose calling *P. j. hunzaica*, sub-sp. n.

6. *P. jacquemontii shandura*, sub-sp. nov. Pl. IV, Fig. 3 ♂, 4 ♀.

This is the smallest and palest form of *P. jacquemontii* in the North-West of India; the males are very white looking and both sexes either entirely lack or have very little dusky powdering on the wings. The females have red tornal spots on both sides of the hind wing.

Expanse: ♂. ♀, 60-64 mm.

Described from three males in the British Museum and two males and three females in my collection all from the Shandur Pass, Chitral.

The types are in my collection and para types are in the British Museum.

7. *P. discobulus baroghila*, sub-sp. nov. Pl. IV, Fig. 1 ♀

This form is smaller than *P. discobulus* from the Shandun Pass and not so dark. The females have no red tornal spots on the hind wing and agree with *P. discobulus* from the Shandun Pass in this respect.

Expanse: ♂ 66–70; ♀ 64–70 mm.

A very fine series of this insect was obtained by Lieut.-Col. D. L. Lorimer, late Political Agent, Gilgit, on the Baroghila Pass at the extreme north-east corner of Chitral.

The types are in my collection and para types are in the British Museum.

8. *Parnassius discobulus hunzaica*, sub-sp. nov. Pl. IV, Fig. 2, ♀

This form is very like *P. d. baroghila* but averages smaller and is much darker especially in the females which are as dark as the females of *P. discobulus* from the Shandun Pass. It is very near if not identical to an unnamed form in the British Museum from the Hindu Kush and which is the *rhodius* of other authors, not *rhodius* of Honrath. The type of *P. rhodius* Honr, a male is in the Adam's collection in the British Museum and is according to Mr. Riley an *epaphus* form and therefore the *jacquemontii* forms which have been known by the name of *rhodius* require a new name and I propose the above for this form.

Expanse: ♂ ♂ 64, ♀ ♀ 64-70.

Numerous specimens of both sexes were received from Misgar in Hunza, taken in August; it appears to be very common.

9. *Parnassius delphius stoliczkana*, Fd.

A female taken south of Leh in Ladak agrees well with the figure of the type specimen and the figure given by Moore.

There are no specimens of true *P. stoliczkana* in the British Museum but there were two specimens over the label of this name which have nothing to do with this form, one being a specimen of my *P. delphius rileyi* from the Rupal Valley in Astor and the other of doubtful locality.

10. *Parnassius delphius chitralica*, Verity

P. delphius chitralica from Chitral is very similar to *P. delphius hunza* Gr-Gr., the type of which is from the Hindu Kush probably north of Hunza in Eastern Gilgit but rather smaller and darker.

Two specimens were received from Yasin, Western Gilgit, on the borders of Chitral which are similar to typical *chitralica*. Three specimens from Misgar, Hunza are like *chitralica* but larger and are darker than *hunza* but approach the latter in size.

11. *Parnassius delphius rileyi*, sub-sp. nov. Pl. IV, Fig. 6 ♂, 7 ♀

Male and female very near to *P. nicevillei* from the Burzil Pass, Gurais, which again is very close to *P. atkinsoni* from the Pir Panjal and from Haramosh Mountain in Gilgit; it differs from the latter in the smaller marginal spots of the hind wind; these spots are about the same size in *rileyi* as in *nicevillei*, the former, i.e., *P. rileyi*, however differs from *P. atkinsoni* in not having the red spot in interspace 2 of the hind wing nearly so well developed; in both *P. nicevillei* and in *P. atkinsoni* this spot is large and bright; in some specimens of *P. rileyi* this spot is very small and inconspicuous and in one it is completely absent and is replaced by a very large black spot.

The types are in my collection and came from Rupal Valley, Astor and the Farsat Pass leading into Chilas. Para types are in the British Museum. The Farsat Pass is on a continuation of the Range of Mountains on the south side of the Rupal Valley.

The insect is not rare and a good series was taken in July and August. I did not meet with *P. nicêvillei* when crossing the Burzil Pass in July.

12. *Parnassius delphius zogilaica*, sub-sp. nov. Pl. IV, Fig. 5, ♀

A single ♀ from near the Zogila Pass, N. Kashmir, differs from its allies *P. nicerillei* and *P. rileyi* in being much paler on both wings and the marginal spots are rather smaller and largely centred with blue; these spots do not touch one another and are placed on a white ground with no dusky scales between them; in *nicêvillei*, *rileyi* and *atkinsoni* the ground colour between these spots is more or less covered with dusky scales.

The specimen obtained agrees well with the description by Avinoff, in the Transactions of the Entomological Society of London, 1915, p. 354, of a male sent to him from Zogila.

♀ Type is in my own collection.

13. *Parnassius delphius atkinsoni*, M.

Type from Pir Panjal, Kashmir.

P. delphius nicêvillei Avinoff, the type of which is from the Burzil Pass between Gurais and Astor in Kashmir, only differs from *P. d. atkinsoni* in having the marginal spots on the hindwing rather smaller.

Major Stockley took four specimens of a form of *P. delphius* on the slopes of Haramosh Mountain in Eastern Gilgit which appear to be *P. d. atkinsoni* and are indistinguishable from specimens of that form from the Pir Panjal. This is curious as these localities are widely separated and two forms at least—e.g. *P. d. zogilaica* and *P. d. nicêvillei* occur between them.

14. *Parnassius delphius florenciæ*, sub-sp. nov., Pl. IV, Fig. 9, ♂

Many years ago I sent a *delphius* form to the late Col. Bingham for identification and he informed me that it was new and named it *P. florenciæ* at my request. I have been unable to trace the publication of the description of this specimen and it is possible he never published it at all, so it may be advisable to describe it again.

Male: Upperside. Rather similar to *P. delphius stoliczkana* Felder but with the wings still whiter and with no dusky scaling in interspaces 1, 2 and 3 of the *forewing* except a very small and clear dark spot in interspace 1 and with no dusky scaling on the hind wing; marginal area of *forewing* very dark and broad bearing a row of small and clear white spots not so disjointed in interspace 4 as in *P. d. stoliczkana*. *Hind wing* marginal area completely dusky with three complete dark spots bearing bluish centres and two small dark spots without blue scales; spots in 2, 3 and 4 are in aline and not as in *P. d. stoliczkana* in which 3 is inwardly thrown out of line; a clear small red spot on the disc and a very small one at the tornal angle.

Underside: Similar to upperside.

A single male was taken in June 1906 near Phup, Hundes, North of Tehri Garhwal, at 15,000 feet.

15. *Parnassius simo lorimeri*, sub-sp. n., Pl. IV, Fig. 10, ♂

Male and female very like *P. boedromus, f. hohlbecki* Avinoff from the Alexandra Mts., Central Asia which may be a form or race of *P. simo* but which Avinoff has treated as a distinct species. The sexes are exactly alike and differ from the form of *P. boedromus* above mentioned in being somewhat paler, the dark spots in cell of forewing not so well developed and in the greater development of the black spot in interspace 5 of the hindwing which is as well developed as the spot in interspace 7.

I have much pleasure in naming this butterfly after Lt.-Col. Lorimer, C.I.E., late Political Agent, Gilgit, who captured a pair on the Kine-Chish Pass, south-west of the town of Gilgit, at about 14,000′. It appears to be very rare and the two specimens captured were the only ones seen; they were flying about at the extreme summit of the Pass which leads into Tribal territory.

16. *Aporia nabellica ferrari*, sub-sp. nov.

The male differs from typical *nabellica* from Kashmir in being much paler than even the females of that form.

The females are very white with black markings and grey powdering on the disc.

Expanse: ♂ 52—60 mm., ♀ 60—62 mm.

Habitat.—Dalhousie, Dugi Pass and Valossa. Several specimens were taken by Colonel Ferrar at Dalhousie in the Western Himalayas and there are four males and four females in the British Museum from the Dugi Pass and Valossa and one ♂ without locality which belong to this race.

17. *Gonepteryx rhamni gilgitica*, sub-sp. n.

Male: Similar to *G. rhamni nepalensis.*

Female. Differs from the ♀ of *nepalensis* in having the extreme base of the costa and the apex of the forewing distinctly tinged with ochreous yellow and the dorsal area and terminal margin of the hindwing as far as v. 4 also tinged with the same colour.

Habitat: Gilgit; Astor; Chilas. A large series of both sexes were received from the above mentioned places.

The types are in my collection and para types are in the British Museum.

18. *Gonepteryx rhamni burmensis*, sub-sp. n.

Male: *Upperside* very similar to *G. rhamni major*, Oberthur, from western China but smaller and orange spots much smaller. The yellow on the forewing is distinctly darker than the hindwing.

Female: *Upperside* both wings of the same colour as the hindwing of the male and similar to the ♀ of *major* named by Verity ♀ *ab. mascula.* In *major* the typical ♀ is cream colour, a yellow form *mascula* Verity occurring occasionally; in *burmensis* the typical ♀ form is yellow, I have not seen any cream coloured females.

Expanse: ♂ 62 mm., ♀ 66 mm.

Habitat: Southern Shan States.

The types are in my collection and para types are in the British Museum.

19. *Colias wiskotti chrysoptera*, Gr.-Gr.

A male and three females were obtained from the Baroghil Pass Chitral, Yarkhun, Ghizer and Gilgit. The females vary greatly *inter se*:—

One is orange-yellow.

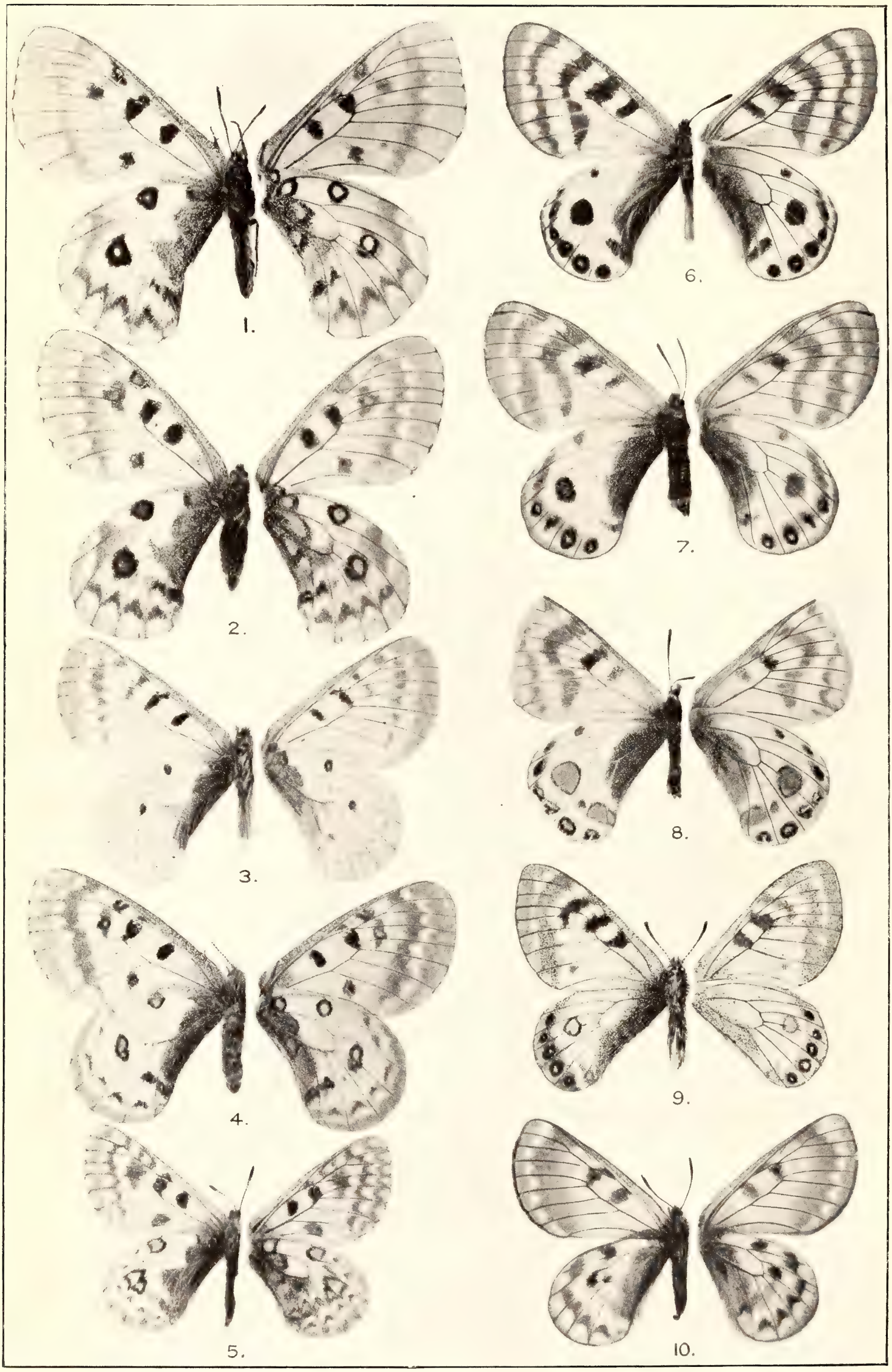
One lemon-yellow.

One white approaching ♀ *ab: leachi* Gr-Gr., but with the dorsal margin upper hind wing distinctly tinged with yellow.

20. *Colias marcopolo*, Grm.-Grsh.

A male taken in the Thui Nala, Yasin Gilgit, in September agrees well with specimens in the British Museum from Turkestan and the Hindu Kush but the inner margin to the black border of the forewing is *conspicuously* indented and forms a continuous row of luneles.

This species has not previously been recorded from within Indian limits.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SOME NEW AND INTERESTING BUTTERFLIES FROM INDIA AND BURMA.

SOME NEW AND INTERESTING BUTTERFLIES FROM INDIA AND BURMA.

Explanation of Plate IV.

Fig. 1. *Parnassius discobolus baroghila*, ssp. n., ♂
,, 2. ,, ,, *hunzaica*, ssp. n., ♀.
,, 3. ,, *jacquemontii shandura*, ssp. n., ♂.
,, 4. ,, ,, ,, ,, ♀.
,, 5. ,, *dongalaica*, ssp. n., ♀.
,, 6. ,, *delphius rileyi*, ssp. n., ♂.
,, 7. ,, ,, ,, ,, ♀.
,, 8. ,, ,, *zogilaica*, ssp. n., ♀.
,, 9. ,, ,, *florenciæ*, ssp. n., ♂.
,, 10. ,, *simo lorimeri*, ssp. n., ♀.

21. *Colias cocandica hindnencica*, Verity

Four males and three females of a form hardly distinguishable from specimens of *C. hinducucica*. Verity from the Hindu Kush Mountains in the British Museum were received from Misgar, Hunza Gilgit.

This species has not previously been recorded from within Indian limits.

22. *Oeneis garhwalica*, sp. nov. Pl. IV, Fig. 4, ♀

Male : *Upperside* pale yellowish brown, very much the same colour as *Paroeneis pumilus* Felder.

Forewing : basal area and cell brownish and a broad brown marginal area ; a row of dark spots in interspaces 2, 3 and 5 ; *hindwing :* a broad brown marginal area as in the forewing ; dark markings on underside showing through on both wings.

Underside : Forewing a brown streak across the upper portion of the cell, another closing it and an irregular brown line just beyond it from costa to the dorsum ; a broad brown marginal band ; *hindwing* pale lilac speckled with brown ; a broad dark band starting at the costa bent at right angles at its middle and reaching the middle of the dorsum ; a broad marginal band ; veins pale lilac.

Female : as in male but paler.

Three males and a female were taken at Shiruans, Garhwal, at 13,500′ in July.

The types are in my collection and a para type of the male is in the British Museum.

23. *Pararge menava moeroides*, Fd.

A male and two females from Ladak appear to belong to this form ; the male has a distinct small yellow patch on the forewing as in *moerula* and *schakra* but much smaller and not so bright. The females have a large yellow patch as in *moerula* and *schakra* but brighter.

Moeroides is usually sunk as a synonym of *menava* but it is certainly a very different looking insect and appears to be a distinct race of that species.

24. *Aulocera swaha gilgitica*, sub-sp. nov.

Male and female differ from typical *swaha* on the upperside in having the bands pure white instead of cream colour on the forewing.

On the underside both wings are very pale grey with the markings on the termen of the hindwing very obscure ; bands pure white.

Col. Evans described the form of *swaha* from the Safed Kot at the head of the Kurram Valley as *Kurrama* ; this name should also apply to the form from Chitral from which it is indistinguishable.

Kurrama Ev. appears to be intermediate between typical *swaha* and *gilgitica* nihi.

The types are in my collection and para types in the British Museum.

The correct nomenclature and distribution of *Anlocera swaha* appears to be :—

A. swaha swaha Koll.	Outer Himalayas. Murree to Darjeeling.
A. swaha garuna, Finhst.	Inner Himalayas, Gurais to hills north of Simla.
A. swaha gilgitica, Tyt.	Astor, Chilas, Gilgit.
A. swaha kurrama, Ev.	N. W. Frontier of India, Kurram Valley to Chitral.

25. *Anlocera padma grandis*, sub-sp. nov.

A pair taken in Yasin, Western Gilgit, differs from the typical form in having the white discal band on both wings under and the band on the hindwing curved and not straight.

Underside : the ground colour is lighter and more greyish and the white spots in interspaces 3 and 4 of the forewing coalesce and are not separate.

Expanse : ♂ 82 mm.; ♀ 90—98 mm.

Major Stockley obtained several specimens in Eastern Gilgit which agree with this form in all respects except that the white band on hindwing is straight and not curved.

The types are in my collection. The specimens obtained by Major Stockley are in the British Museum.

26. *Karanasa regeli chitralica*, sub-sp. nov.

There were several specimens of a form of *Karanasa* from Chitral above the type and label of *K. moorei* Evans in the British Museum which are not that species as they do not agree with the type but appears to be a race of the *regeli*; they are rather larger than *K. regeli boloricus* but are otherwise the same. I propose the above name for the Chitral form.

Expanse : ♂ 42 mm.; ♀ 49 mm.

The types are in the British Museum and a ♂ para type in my collection.

27. *Karanasa regeli boloricus* Gr-Gr.

A large number of both sexes were received from Misgar in Hunza, Gilgit, which agree with the male type and with a series of both sexes from the Hindu Kush in the British Museum.

28. *Karanasa moorei gilgitica*, sub-sp. nov.

Very similar to *K. moorei moorei* Ev., but on the *upper* and *undersides* of both sexes the yellow markings are rather washed out and have lighter coloured patches ; on the underside of the hindwing the light markings are paler.

Expanse : ♂ 52 mm.; ♀ 56 mm.

Five males and six females were received from Yasin and Ghizer in Gilgit.

Colonel Evans places his *moorei* as a race of *regeli* but it is quite a different looking insect and it is better I consider to keep it separate.

29. *Karanasa pamirus safeda*, sub-sp. nov.

The form of *Karanasa* from the Safed Koh, Kurram Valley, sent me by Colonel Evans agrees closely with specimens of *K. pamirus josephi* Stdgr, from Bokhara. It is better placed for the present as a race of *pamirus* than as a race of *huebneri*.

I made no note as to how this form differs from *josephi* Stgr. as I was under the impression that Colonel Evans had described it ; but on my return to India he informs me that he did not describe it and although he had appointed types he then thought it was not good enough and asked me to describe it myself. I am unable to do this as I have not the specimens with me. There is however a specimen in the British Museum presented by Colonel Evans labelled *Safeda* Evans and placed as a race of *huebneri* and I think it better to leave this form under the name given it by Colonel Evans than to change it.

The male type is in my collection and a male para type in the British Museum.

30. *Karanasa pamirus pupilata*, sub-sp. nov.

There was a series of a *Karanasa* form from Jhila Drosh, Chitral, in the British Museum and there are also a pair from Chitral in my collection which are different to other geographical forms of *Karanasa huebneri* and its allies and appears to be for the present best placed as a race of *K. pamirus*. In appearance the butterfly is somewhat like *K. pamirus safeda* mihi, but the white patch on the inner edge of the upper ocellus on the forewing is not so well developed and there are no white patches on the inner edge of the ochreous band on the upperside of the hindwing as in that form ; on the underside the cell in the male is not marked with white as in *safeda*.

Expanse : ♂ 45 mm.; ♀ 48 mm.

The types are in my collection and para types are in the British Museum.

31. *Karanasa huebneri astorica*, sub-sp. nov.

The form of *huebneri* occurring in Astoris very close to *K. h. modesta* M., which occurs further east in the Deosai Plateau, but in the *males* the orange of both wings extends more into the brown basal area and in the *females* the orange colour replaces the brown basal area of the forewing as in the form *cadesia* M., which however is not a racial form but a casual variety and which occurs in both the races of *modesta* M. and *astorica* mihi. The female of *modesta* M. has not the orange of the forewing so extended as in the female of *astorica* mihi.

Expanse : ♂ 46 mm.; ♀ 48 mm.

The types are in my collection and ♂ and ♀ para types are in the British Museum.

32. *Karanasa huebneri balti*, sub-sp. n. =*K. leechii. M. nee Gr-Gr.*

Males darker and rather larger than *K. h. pallida* mihi ; some males are very close to *K. h. astorica* mihi but the females are very different and are much paler.

Expanse : ♂ 48 mm.; ♀ 50 mm.

There is a good series of this form from Skoro La, Baltistan and from Kardhong in the British Museum.

This insect was given the name of *leechii* by Moore but this name must fall as *Karanasa leechii* Gr-Gr. has priority and was given to a very different form of *Karanasa* from the Hindu Kush Mountains.

33. *Karanasa huebneri pallida*, sub-sp. n.

The race of *K. huebneri* from the Chongking Valley can readily be distinguished from its allies by the extremely pale colouring of both wings in both sexes.

It is very close to the typical form from Lahoul but the yellow colour on both wings enters the brown basal area which it does not do in Felder's form.

There is a good serioes of this form from the Chongking Valley in the British Museum.

Expanse :—♂ 42 mm. ; ♀ 41 mm.

The types are in the British Museum and para types are in my collection.

34. *Karanasa huebneri huebneri*, Felder

The types of Felder's *K. huebneri* came from Lahoul and the female only was figured. There are specimens of *K. huebneri* from Lahoul in the British Museum and these may be considered typical in the absence of the type.

There has been a good deal of confusion and doubt regarding the various forms of *Karanasa huebneri* and allied species inhabiting the Indian Region. Seitz in his *Macrolepidoptera of the World*, vol. i, p. 127, in treating *K. huebneri* Fd. states :—Now follow a whole series of forms of which some intergrade completely, and then includes the following forms under this species—*cadesia* M (=*Wilkinsi* Ersch., *josephi* Stdgr.), *leechi* Moore, *modesta* Moore, *dissoluta* Stgr., *intermedia* Gr-Grsh., *pamira* Stdgr., and again states ' all these forms often completely intergrade '.

Colonel Evans in his List of Butterflies from the Indian Region lumps all the Indian forms except one—e.g. *moorei* Evans, which he places as a race of *K. regeli* Alph—under the name of *K huebneri* Fd. and gives no geographical races.

Without sufficient material it is very difficult to appreciate the differences amongst the various closely allied forms ; but with the large series I was fortunate in obtaining from Astor and Gilgit together with other forms in my collection and with the fine series in the British Museum it was found possible to appreciate the collective differences of the various species or races when the individuals were placed in their geographical groups. The forms of *huebneri* and allied species appear to be very susceptible to environment and each distinct locality appears to develop a slightly different race.

The following appears to be a fairly satisfactory nomenclature and distribution of the various forms :—

	Type	*Other localities*
K. regeli chitralica, Tyt.	... Chitral	
K. regeli boloricus, Gr-Gr.	... Hindu Kush.	Hunza Gilgit
K. moorei moorei Ev.	... Shandur Pass, Chitral.	
K. moorei gilgitica, Tyt.	... Yasin, Gilgit	
K. pamirus safeda Ev.	... Safed Koh, Kurram Valley.	

	Type	*Other localities*
K. pamirus pupilata, Tyt.	Jhila Drosh, Chitral.	
K. huebneri modesta M.	Deosai Plateau.	
ab : *cadesia* M.	Deosai Plateau.	
K. huebneri astorica, Tyt	Rupal Valley, Astor.	
K. huebneri balti, Tyt.	Skro La Pass, Baltistan.	
= *leechii* M. nee Gr-Gr.		
K. huebneri pallida, Tyt.	Chongking Valley.	
K. huebneri huebneri Fd.	Lahoul.	

35. *Eumenis mniszeckii baldira* M.

The forms of *E. mniszeckii* can at once be separated from those of *E.* of *lehana* occurring within Indian limits by the presence of two small white centred dark spots or dark spots without the white centres placed between the two large black ocelli on the forewing.

Numerous females were received from Yasin, Gilgit, and a male undoubtedly of this form from Baluchistan was sent to me by Mr. E. Ollenbach. There are numerous specimens of both sexes in the British Museum and all have the dark spots with or without a white centre on the forewing as in typical *E. mniszeckii* but which are absent in *E. lehana*.

36. *Eumenis lehana droshica*, sub-sp. n.

A form of *Eumenis* occurring in Drosh, South Chitral and in the Shandur Pass, North-East Chitral appears to be a race of *E. lehana* but differs from typical *lehana* from Kardong, Ladak in the yellow bands and the basal brown areas of both wings being darker and in the yellow band of the hind wing in both sexes being broader and extending to the tornal angle.

The types are in my collection and para types are in the British Museum

37. *Eumenis lehana gilgitica*, sub-sp. n.

The form of *lehana* occurring in Ghizer, Gilgit, differs from the typical form from Ladak in having the yellow bands on the *forewing* narrower and darker as in *E. legana droshica*, and the yellow on the hindwing is also darker as in *droshica*, but the extent of the yellow is as in typical form and does not reach the tornal angle as in *droshica*. A good series of both sexes were taken by Lieut.-Col. Lorimer, Political Agent, Gilgit at Ghizer, Gilgit, and I possess specimens from the Shandur Pass where this race apparently meets with *droshica* mihi.

38. *Eumenis lehana clarissima* Seitz.

There were specimens in the British Museum of a form of *E. lehana* from Skardo Dras, the Chongking Valley and Hunza over the label *Eumenis lehana clarissima* Seitz and I have received specimens from Misgar Hunza and from Upshi which agree with these specimens but I am not at all sure that the name *clarissima* should apply to them as the type of *clarissima* is said to come from West China but this may possibly be a mistake. Those specimens agree with Seitz's figures of *clarissima* and the yellow bands anteriorly are paler.

The form from Skardo and Misgar are very close to typical *E. lehana* and are hardly worth separating.

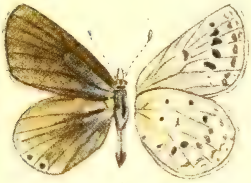
39. *Erebia mani kamriana*, sub-sp. nov. Pl. I, Fig. 12, ♂

Male and Female : Forewing, apex more pointed than in the typical form and similar to *E. mani chitralica* Ev. but not so pointed as in *E. yasina* mihi and *E. lorimeri*, mihi. *Upperside*, a large patch on the forewing as in typical *E. mani* de N., but of a deep ferruginous colour somewhat as in *E. kalinda chitralica* Ev. but brighter ; basal half of forewing brown ; yellow rings to ocellus small. *Underside* : Forewing the red ferruginous patch large reaching base of v. 1 ; yellow ring to ocellus as on upperside.

Expanse ; ♂ 50 mm. ; ♀ 52 mm.

Several males and females were taken on the Kamri Pass, Gurais and a male on the Babusar Pass, Chilas, in August.

The types are in my collection and a male para type is in the British Museum collection.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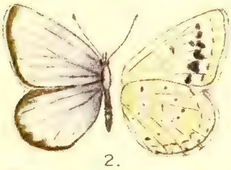
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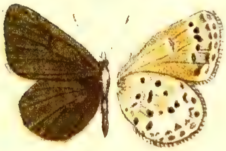
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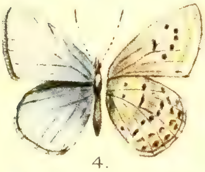
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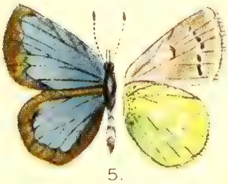
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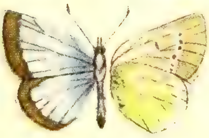
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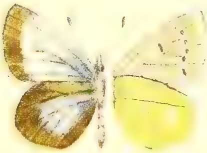
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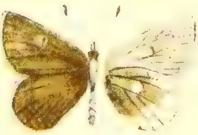
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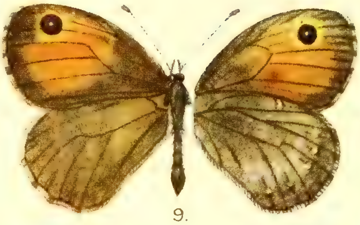
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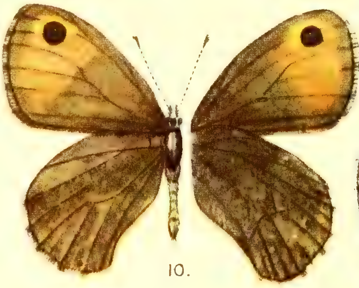
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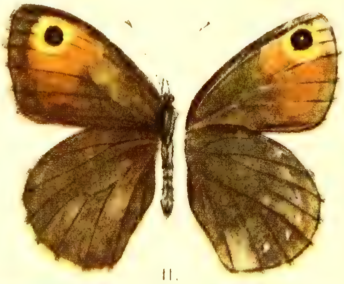
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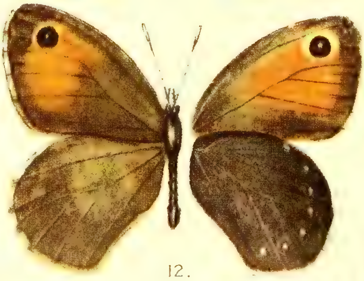
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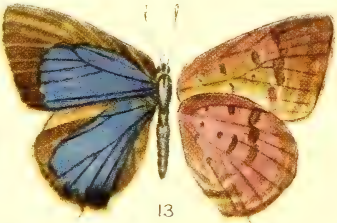
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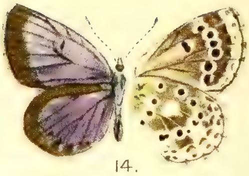
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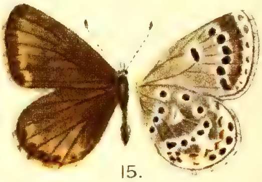
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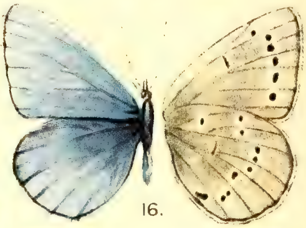
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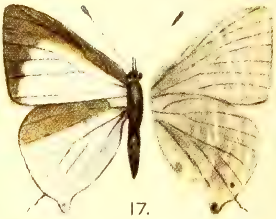
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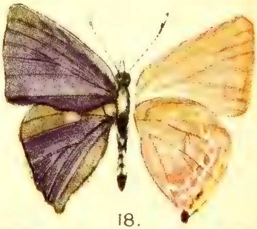
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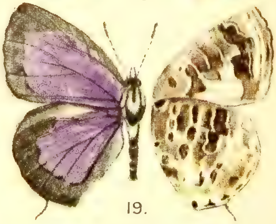
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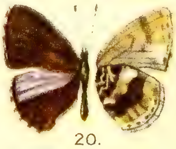
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Barbara Hopkins.		John Bale, Sons & Danielsson, L^td

SOME NEW AND INTERESTING BUTTERFLIES FROM INDIA AND BURMA.

SOME NEW AND INTERESTING BUTTERFLIES FROM INDIA AND BURMA.

Explanation of Plate I.

Fig. 1. *Lycæna baroghila*, sp. n. ♀.
,, 2. ,, *christophi lesliei*, ssp. n., ♂.
,, 3. ,, *astorica*, sp. n., ♂.
,, 4. ,, *florenciæ*, sp. n., ♂.
,, 5. ,, *galathea depreei*, ssp. n., ♂.
,, 6. ,, *metallica chitralensis*, ssp. n., ♂.
,, 7. ,, ,, *gilgitica*, ssp. n., ♂.
,, 8. ,, *orbitulus astorica*, ssp. n., ♀.
,, 9. *Erebia mani shandura*, ssp. n., ♂.
,, 10. ,, ,, *lorimeri*, ssp. n., ♂.
,, 11. ,, ,, *yasina*, ssp. n., ♂.
,, 12. ,, ,, *kamriana*, ssp. n., ♂.
,, 13. *Amblypodia suffusa atarana*, ssp. n., ♀.
,, 14. *Polyommatus sarta rupala*, ssp. n., ♂.
,, 15. ,, ,, ,, ,, ♀.
,, 16. ,, *iolas gilgitica*, ssp. n., ♂.
,, 17. *Virachola dohertyi*, sp. n., ♂.
,, 18. *Rapala rubida*, Tytler, ♂ (n.n. pro *rosacea*, Tytler preocc.)
,, 19. *Amblypodia maymyoica*, sp. n., ♂.
,, 20. *Orthomiella putaoica*, sp. n., ♂.

40. *Erebia mani shandura*, sub-sp. nov. Pl. I, Fig. 9, ♂

The types, a pair from the Shandur Lake, Chitral, in the British Museum collection are different to any other form of *E. mani* that I have seen and appear to be a distinct race.

Male and Female : Forewing rounded as in the typical form.

Male. Upperside : Forewing, the reddish fulvous patch as in the typical form but darker and also darker than in *E. mani lorimeri* mihi ; but not so dark as in *E. mani kamriana* mihi. Underside, the reddish fulvous patch fills the whole of the forewing almost up to the base ; the pale yellow ring to ocellus broad and distinct.

Female. Upperside : Forewing, fulvous patches as in typical *E. mani* female and much yellower than the male. Hindwing, a small dark ferruginous discal patch present. Underside as in the typical form.

Expanse : ♂ 46 mm. ; ♀ 53 mm.

41. *Erebia mani yasina*, sub-sp. n. Pl. I, Fig. ♂, 11

Forewing : apex pointed and not rounded as in typical form.

Male. *Upperside* : differs from *E. mani shandura* mihi, in having the apical fulvous patch on forewing much reduced in size ; underside very similar to *E. mani shandura*.

Female. *Upperside* : very similar to the male but the basal two-thirds of the forewing reddish yellow and the apical third pale yellow.

Expanse : ♂ 50 mm.

A pair were received from Yasin, Gilgit.

The types are in my collection.

42. *Erebia mani lorimeri*, sub-sp. nov. Pl. I, Fig. 10, ♂

Male and Female : Apex of forewing pointed as in *E. mani yasina* mihi.

Male. Upperside : on forewing, a large fulvous patch as large as in the typical form with its inner edge ferruginous ; ocellus without a white centre as in *E. yasina* mihi. Underside : the coloured patch on forewing extending into cell up to V. 1, the outer half being yellowish fulvous and the inner half ferruginous.

Female very similar to the male.

Expanse : ♂ 50 mm. ; ♀ 54 mm.

The types were received from the Haitu Nullah, Ghizer, Gilgit, and are in my collection.

43. *Maniola pulchra chitralica*, sub-sp. nov.

This form is nearest to and between *M. pulchra neoza* Lang from the Kashmir Valley and a form of *pulchra* which occurs in Gilgit up to 9000′. It is smaller than the former but larger than the latter and the female is rather brighter than the female of *M. pulchra neoza* Lang.

Expanse : ♂ 41 mm. ; ♀ 44 mm.

Habitat : Chitral, up to 9000′.

The form from Gilgit besides being smaller is rather paler and approaches the next form *M. pulchra baroghila* mihi which occurs at high elevations.

The types are in my collection and para types are in the British Museum.

44. *Maniola pulchra baroghila*, sub-sp. nov.

The race of *pulchra* from the extreme north-east corner of Chitral and the watershed between Chitral and Wakhan, Afghanistan and the adjoining country on the extreme north-west of Yasin in Gilgit at elevations over 9000′ differs from the typical form in being much smaller, being the smallest of all the races, and on the upperside rather paler. On the underside of the hindwing there are small patches of pale yellow in the cell and on the outer edge of the dark discal irregular line.

Expanse : ♂ 37 mm. ; ♀ 38 mm.

A fair series was received from the above mentioned localities.

The types are in my collection and para types are in the British Museum collection.

45. *Maniola pulchra astorica*, sub-sp. nov. Pl. III, Fig. 5, ♀

This race agrees in size with typical *pulchra* from Lahoul but smaller than *M. pulchra neoza* Lang. It differs from the typical and other forms of *pulchra* in the female having the disc of the upper forewing entirely yellow as in *M. pulchella* Fd. The female of *astorica* can however be separated from the same sex of *pulchella* by having a pale yellow iris encircling the black apical ocellus on the forewing which is entirely wanting in *pulchella*.

Expanse : ♂ 42 mm. ; ♀ 44 mm.

Numerous males and females were taken in the Rupal Nullah and at Rama in Astor and also a few from Ladak in July and August at 11,000′. The form from the hills surrounding the Kashmir Valley is *M. pulchra neoza* Lang and is the largest of all the races.

46. *Maniola pulchra pulchra*, Felder

The type is probably from Lahoul and a male specimen in the British Museum from that locality agrees with the description of the type and is very yellow on the forewing, approaching *M. pulchella* to which Felder likens it ; the hindwing upperside has yellowish discal patches. This specimen and probably Felder's type are aberrant as all the other male specimens from Lahoul, Spiti, Panji, etc., are like the ordinary males from other localities and have the forewing covered with dense brown scales and no traces of yellow on the hindwing.

I possess specimens from Garhwal which probably belong to this race.

47. *Maniola cheena chitralica*, sub-sp. nov.

The Chitral race of *M. cheena* has the yellow iris to the ocellus on forewing as well developed as in the typical form, but the insect is much smaller and of the same size as *M. cheena kashmirica*. The types of *M. cheena* M. are from Kunuwar and are in the British Museum. The male has yellow patches below the apical ocellus on the upperside of the forewing and the female has also the yellow on the forewing well developed and conspicuous. The male type appears to be aberrant as other specimens from the same locality have only traces of the yellow patches below the apical ocellus on the forewing.

The Kashmir race *M. cheena kashmirica* is smaller than the typical form from Kunuwar and the yellow iris to the ocellus on forewing is smaller and not so conspicuous.

The types are in my collection and para types are in the British Museum.

The following appears to be the nomenclature and distribution of the various forms of *Maniola* within Indian limits :—

	Type locality	*Other localities*
M. pulchella, Fd. ...	... Ladak.	Astor, Gilgit, Deosai Plateau, Dras.
M. pulchra chitralica, Tyt.	... Chitral, below 9,000′	Gilgit below 9000′.
M. pulchra baroghila, Tyt.	... Baroghil Pass, N. E. Chitral, above 9,000′	Yasin, N. W. Gilgit, above 9,000′.
M. pulchra astorica, Tyt.	... Astor.	Gurais, Dras, Ladak.
M. pulchra neoza, Lang.	... Kashmir.	Tragbal, Pir Panjal, Shamshiri, Dugi Pass.
M. pulchra pulchra, Fd.	... Lahoul ?	Lahoul, Dalhousie, Kokser Pass ; Garhwal.
M. cheena chitralica, Tyt.	... Tarban, Nala and Utzen, Nala Chitral.	
M. cheena kashmirica, M.	... Kashmir.	
M. cheena cheena ...	... Kunuwar.	

48. *Lethe armandii khasiana*, M.

There has been a great deal of confusion about this form and in the Journal of the Bombay Natural History Society, vol. xxiii p. 223 I attempted to clear up the matter and showed this *khasiana* was not a form of *bhadra* but that it was an *armandii* form and I thought it was true *armandii* but erroneously so. I have lately compared the type of *khasiana,* which is a dry season form, with true *armandii* from China and find that there is a marked difference in the two forms and that the *former* will now have to stand as a race of *armandii.* In the *wet season* males of *khasiana* from the Naga Hills all the yellow markings are brighter and larger than in the wet season form of *armandii* from China and the cell of the forewing has at its apex a yellowish bar ; the females are very similar to the females of typical *armandii* with the exception of the presence of the apical yellow bar to the cell of the forewing, absent in typical *armandii.*

In the *dry season* male type of *khasiana* the markings on the upperside of the apical area of forewing are white and not yellow as in the *dry season form* of typical *armandii* and the yellow on the hindwing is darker and tinged with orange and enters the cell.

A single male of the *dry season* form from Bernardmyo, Upper Burma, in the British Museum is intermediate between *khasiana* from the Khasi and Naga Hills and *armandii* from West China ; the forewing agreeing with *khasiana* and the hindwing with *armandii* in the shade of yellow which however enters the cell as in *khasiana.*

The following appears to be the correct nomenclature and distribution of *L. armandii* :—

L. armandii armandii oberthur ...	d. s. f ;	West China.
= *fusca* ...	w. s. f ;	,,
L. armandii khasiana M ...	d. s. f ;	Khasi Hills, Naga Hills.
= *unnamed form* ...	w. s. f.	Naga Hills.
L. armandii sub sp.	d. s. f.	Bernardmyo, North Burma.
L. armandii lacticolora, Fruhst ...	w. s. f.	,,
= *saggitata* Wilen ...	d. s. f. ?	Formosa.

The form from Bernardmyo may form a local race but more material is required to determine whether the differences above noted are constant or not.

49. *Mycalesis suaveolens sebonga,* sub-sp. n.

A male and female from the North Chin Hills in the British Museum and a large series taken by my collectors at Sebong, Manipur, and in the Manipur Valley and Naga Hills are quite distinct from the typical form of *Suaveolens* from Sikkim and Bhutan and form a well marked race.

Underside : wet season form very similar to the typical form but all the ocelli very much smaller ; the *dry season form* in addition to having the ocelli much smaller has the outer area beyond the discal band on both wings very conspicuously paler.

The types from Sebong are in my collection and para types from the Chin Hills are in the British Museum.

50. *Mycalesis suaveolens duguidi,* sub-sp. n.

Male and female : *Upperside* very similar to *M. suaveolens sebonga* mihi. *Underside* differs in being paler brown and the white bands on both wings tinged with brown ; cilia brown and not white as in *the typical form* and in *sebonga.*

Several males and females were received from Loimwe in the Southern Shan States caught in May and August at about 5,000′.

The types are in my collection and a male para type is in the British Museum.

The occurrence of this form in the Southern Shan States considerably extends the range of the species to the south and east.

I have much pleasure in naming this form after Capt. Duguid who obtained the specimens and kindly presented them to me.

51. *Faunis arcesilaus* F.

A male and female received from Loimwe, Southern Shan States, differs from the typical form in having the apical third of the forewing on the underside conspicuously paler than the rest of the wing.

Loimwe is close to the Chinese border in the Southern Shan States and the butterflies from this locality are but little known. It is quite possible that these specimens represent a race of this species.

52. *Faunis faunuloides* de N.

Colonel Evans in his 'Identification of Indian Butterflies' states that the genus *Faunis*, Hubner has a prominent tuft on the upperside hindwing from v. 1 below base of cell and that there may be a brand on 1*a* of the hindwing near the tornus covered by a tuft; and in his key to the genus *Faunis* states that the male *faunuloides* on the upper hindwing has a brand on v. 1 (*a*). He gives a figure of *F. faunula* from the Malay Peninsula which clearly shows the brand on v. 1 (*a*). He also places *F. faunuloides* de N. as a race of *faunula*.

Fruhstorfer in Seitz's work also mentions that *F. fannula* has a second tuft on the hindwing and also places *Fannuloides* as a race of *fannula*.

Fruhstorfer states that only five females have so far been secured from the Chin Hills and presumably he has never seen a male and it is possible that Colonel Evans also has not seen the male and that the male has hitherto been unknown.

I have lately received two males and three females from the Chin Hills and they are exactly the same as the female but for the sex mark.

The males however do not agree with Evan's key in the following respects :—

(*a*) On the hindwing the tuft at base of cell is from below the median nervure and not from v. 1.

(*b*) There is no brand on v. 1 (*a*) near the dorsum hindwing.

As regards (*a*) Evans probably intended to say *median vein* instead of v. 1; but as regards (*b*) he is incorrect in stating that *faunuloides* has a brand on v. 1 (*a*) of the hindwing. If *F. faunula* from the Malay States has the brand on v. 1 (*a*) near the dorsum of hindwing as Evans and Fruhstorfer state then I consider that *F. faunuloides* de N. which has not got this brand cannot be conspecific and must retain its specific rank.

The specimens received by me were taken by my collector in September; de Nicéville and Fruhstorfer record it as having been taken in June. It is therefore probably double brooded.

53. *Aemona lena haynei*, sub-sp. nov. Pl. III, Fig. 9, ♂

Male. *Upperside*: *forewing*; yellow with patches of paler colour in the interspaces beyond the discal brown band; apical area dusted with smoky brown scales. *Hindwing*: yellow the area between the double marginal lines in interspaces 4, 5 and 6 sometimes but not always paler than the ground colour. *Underside* as in the typical form.

Female as in the typical form.

In *Aemona* lena the sexes are alike; in *haynei* they are very different the male being a yellowish insect lacking nearly all the pale markings of the female.

Habitat: Maymyo, N. Shan States.

A fair number of both sexes were obtained in April and May and again in September, in dense shade and near water. The insects as a rule keep to the low undergrowth a foot to three feet above the ground and on being disturbed fly a short distance and settle down again. On one occasion I saw about half a dozen males sitting on the stem of a tree 20′ up. It is not rare but appears to be very local.

The types are in my collection and para types are in the British Museum.

I have much pleasure in naming this form after Dr. Hayne who first discovered it and told me where to look for it.

(*To be continued*)

A CONTRIBUTION TO THE ORNITHOLOGY OF DELHI

BY

THE LATE S. BASIL-EDWARDES, M.B.O.U., R.A.O.U.

PART I

(*With 2 plates*)

During the winter of 1924–25 while I was in Delhi I made a small collection of birds and accumulated a number of notes. This was done with the dual object of adding specimens new to my collection and of enabling me to prepare a list of the birds of Delhi at some future date. As, however, I cannot readily trace any literature dealing specifically with the birds of this locality, and as I was fortunate in obtaining some interesting specimens, some useful purpose may perhaps be served by placing these notes on record now, instead of waiting indefinitely. Five months is too short a time in which to obtain anything approaching a complete knowledge of the birds of the district ; but two or three years' continuous observation and collecting in all types of country ought to produce interesting results. I did not obtain, nor even did I see, any specimens of certain families of birds, e.g., Buntings or Rails, not because there were none to be had, but because I could not find the time to work suitable localities. I have included the names of all species observed in order to make this paper more complete ; but the following notes can only be regarded as a nucleus for a more comprehensive paper on the ornithology of the Delhi Province. If and when a suitable opportunity arises, I hope to add further notes on the birds of Delhi, and by this means place on record a fuller account of the avifauna of the Province.

My activities were confined to the immediate neighbourhood of the City itself, chiefly at Raisina, with occasional excursions to places nearby, such as Okla, Kingsway, etc. Bird-life is abundant in the Delhi Province, and quite a number of common species visit one's garden. I found the babool jungles in and around Raisina very convenient and profitable hunting-grounds, as also the Ridge, and the canal near Kingsway. Unless otherwise stated, my notes refer to the neighbourhood of Raisina. I was not on leave and most of my leisure hours were occupied in collecting birds only, so that I could pay little or no attention to birds' nesting. I have, however, included a few stray notes on nests found during my stay in Delhi in the winter of 1924–25 and on some eggs collected by me a few years ago. I have also included particulars of eggs taken by Mr. F. H. Cole, an ardent young oologist, who was in Delhi during the months of November 1924 to March 1925. Scattered throughout *Nests and Eggs of Indian Birds* are a number of notes by Major C. H. T. Bingham on the eggs collected by him in Delhi, and these notes I have culled and incorporated briefly in my paper, as I think they form a useful and valuable complement. Reference to Bingham's oological notes on Delhi birds will be found in square brackets, thus : ' [Eggs taken by Bingham April–July] ' I have endeavoured wherever possible to indicate the status of each species recorded below ; it should be explained, however, that I have in many cases regarded certain species as resident, basing my conclusion on my own personal observation of such species throughout the winter, and on Bingham's oological notes which refer to the summer months. I think that this is justifiable, and will, in the majority of instances, be found to be correct. I arrived in Delhi on November 2, 1924, and left for Simla on April 3, 1925, and during this period of five months I collected almost daily. The total number of specimens obtained was about 230—a fair result as I had to work unassisted at collecting, skinning, and writing up my notes. In the case of certain species a small series of each was obtained.

As most of my collecting was done in and around Raisina and the outskirts of Delhi City, with occasional excursions to places near by, such as Kingsway and Okla, it does not appear necessary to describe the boundaries and extent of the Delhi Province. Similarly, I shall not enter into any detail about the flora or climate of the province as a whole. All this may be left for some future occasion when my ornithological activities in Delhi have been more extended. For the present, therefore, I shall confine myself to a few remarks on the kind of country I have actually seen and worked.

For the most part Raisina, or New Delhi as it is also called, is a gently undulating, open tract—a city and its environs in embryo, which is developing rapidly. The country round about consists of open spaces, covered either with short grass or low, scrubby bushes, with the babool (*Acacia arabica*) growing freely everywhere. On the outskirts of Raisina, scattered about in patches of greater or lesser extent, are babool jungles. Fields and cultivated tracts occupy certain portions. Deserted towns and tombs lie in every direction ; some cared for under Government supervision, some dilapidated and crumbling-falling to pieces amid desolate and dreary surroundings. Where there are pools, canals, or borrow-pits, reeds and long grasses fringe the water's edge. The banks of the River Jumna are, in winter, bare stretches of sand on which the tamarix or jhow (*Tamarix dioica*) grows in great profusion. At Okla is situated a weir and sluice-gates where the waters of the Jumna are controlled and diverted by canals. Some sort of a park and garden exists here—a pleasing contrast to the bare and rather monotonous aspect of the banks which stretch out on either side beyond the grounds at Okla. The historic Ridge of Delhi, which is an extension of the Mewat branch of the Aravalli Hills, forms a conspicuous and characteristic physical feature. The vegetation on the Ridge consists, as may be expected, largely of low, thorny bushes and cactus. At Kingsway there are low-lying fields, subject to nundation during the rains. The Nuzzargarh Cut Drain also passes through Kingsway. Off the Karnal road lies the comparatively large 'Horse-shoe Jheel', so-called on account of its shape.

Leaving out of consideration the babool (*Acacia arabica*), which is excessively common, some of the chief trees are *Salvadora persica* and *Butea frondosa* (which predominate in the uncultivated tracts), *Tamarindus indica*, *Melia azadirachta* and *azadarach*, various kinds of *Ficus*, etc. The only wild palm is *Phœnix sylvestris*. *Trappa bispinosa*, *Nelumbium speciosum* and *Typha latifolia* are common water-plants ; while *Opuntia dillenii*, *Agave americana* and *Aloe vera* are the commonest succulents. The following wild plants may be mentioned : *Zizyphus jujuba* and *nummularia*, *Prosopis spicigera*, *Cryptostegia grandiflora*, *Argemone mexicana* and *Adhotada vasica*. *Saccharum arundinaceum* grows in profusion on embankments, etc. ; *Berberis aristata*, a dense, thorny shrub, grows along the borders of cultivated fields and in dry, rocky situations ; *Capparis aphylla* and *horrida* are common in waste lands and among ruins ; and *Tribulus terrestris* is a common weed.

I am only able to write of the winter in Delhi, as I have had no personal experience of the summer months or the rains. It is rather pleasant during the months of October and November, but the weather thereafter becomes cold. By the middle of February it begins to warm up again, and the latter half of March is unquestionably hot, though the nights are fairly pleasant if there is a breeze. In March high winds and dust-storms are of rather frequent occurrence.

A few photographs have kindly been taken for me by Mr. E. S. Keymer. These illustrate various types of country and serve to indicate the haunts of certain species of birds, while they also possess a topical interest.

The scientific nomenclature used is that employed in Mr. E. C. Stuart Baker's *Hand-List of the Birds of the Indian Empire*. Modifications have been made where necessary in the light of the first two volumes of the second edition on Birds in the *Fauna of British India* series and of other publications.

In conclusion, I wish to express my thanks and gratitude for the kindly assistance in many ways which has been rendered me by Mr. H. Whistler, F.Z.S., M.B.O.U., and by Mr. A. E. Jones, M.B.O.U. My thanks are also due to Dr. C. B. Ticehurst, M.D., M.B.O.U., for the willing manner in which he has identified certain skins and for some useful suggestions in regard to the preparation of this short paper.

BABOOL TREES ALONG THE MUTTRA ROAD
Haunts of *Argya malcolmi*, *Phœnicurus o. phœnicuroides*, *Pericrocotus p. peregrinus*, *Lanius vittatus*, etc.

BABOOL JUNGLE AT RAISINA, DELHI
The haunts of a variety of small birds.

THE CANAL AT OKLA, DELHI

Haunts of *Ceryle e. leucomelanura*, *Ardeola grayii*, etc.
Clump of trees in background—haunts of *Cuncuma leocorypha*.

A PORTION OF THE RIDGE AT RAISINA, DELHI

Haunts of *Argya c. caudata*, *Franklinia buchanani*, *Lanius e. lahtora*, *Uroloucha malabarica*, *Cyrtostomus a. asiaticus*, etc.

Corvus corax laurencei (Hume). The Punjab Raven.

Hume writes : ' Even in the Delhi Division of the Punjab they breed sparingly . . .' I did not meet with any Ravens.

Corvus splendens splendens (Vieill.). The Indian House-Crow.

Four winters ago I remember seeing a specimen which had some white in the wings. This bird would frequent the neighbourhood of Kingsway Camp. The bones or flesh of this bird, in the eyes of the Hindus of Delhi, appear to possess some medicinal or magical properties. When out collecting near a village one day I was asked by a Hindu villager to shoot a Crow which he said he required for a certain purpose. I was not able to ascertain the exact purpose, however. Subsequently, I saw a man hawking round many dozens of live Crows for sale. These were being carried in flat baskets covered with string meshing—one basket at either end of a bamboo slung across the shoulders. The baskets were similar to those in which poultry and wild duck are carried. I have no information as to the method of capture of the Crows.

Corvus coronoides subsp. Jungle-Crow.

Bingham writes : ' This Crow (*macrorhynchus*, Wag.), so common at Allahabad, is very scarce here at Delhi. In fact, I have only seen one pair.'

I can endorse Bingham's remarks about the scarcity of Jungle-Crows in Delhi : they are certainly not common. A pair were seen on December 14, 1924, haunting an old ruin known as the Hauz Khas. The birds were not seen again when I visited the place on December 28, 1924, and during the rest of my stay I saw no *coronoides* Crows though I was always on the watch for them.

Dendrocitta rufa vagabunda (Blyth.). The Bengal Tree-pie.

Quite common. A specimen obtained belongs to this race. Wing 165 mm. Tail 285 mm.

Argya caudata caudata. (Dum.). The Common Babbler.

Generally found among long grass, or on thorny bushes on the Ridge. I neglected to collect a sufficient number of this common bird until it was too late. Only two specimens were procured. A ♂ on February 28, 1925 and a juv. ♀ on December 5, 1924. These appear to be of the typical race. Wing of ad. ♂ 76 mm,

[Eggs taken by Bingham. March-June.]

Argya malcolmi (Sykes). The Large Grey Babbler.

This is by far the commonest Babbler in Delhi. Abundant everywhere in exceedingly noisy parties. Generally nests in babool trees.

[Eggs taken by Bingham. March-August.]

Turdoides terricolor terricolor (Hodg.). The Bengal Babbler.

Common. Appears to prefer shady gardens and groves to babool trees, which is the typical haunt of *Argya malcolmi*. This Babbler seems to be rather a wary bird at times.

[Eggs taken by Bingham. April-July.]

Ægithina nigrolutea (Marsh). Marshall's Iora.

I did not find this pretty little bird at all common. Two obtained on December 11, 1924, were haunting babool jungle. One of them, apparently the ♂, was observed to fly up into the air and come spinning down to the tree with his feathers fluffed out. This habit has been described in the *Fauna of British India*. Birds, vol. i, page 342, second edition. An examination of the genital organs of the birds obtained showed them to be normal, so that this curious habit is not confined to the breeding season. Another pair of Ioras were seen on the Muttra Road, about 8 miles from Delhi, on February 8, 1925, and both were obtained.

At the time I obtained these Ioras I thought they were *Ægithina tiphia, tiphia* but on examination I found them to be undoubted examples of *nigrolutea*. Hume states (*Stray Feathers*, vol. vii, page 454) that all the Ioras collected by Cleveland in the Gurgaon District were, without exception, *nigrolutea*. In this connection his ' Remarks on the Genus *Iora* ' in *Stray Feathers*, vol. v, pp. 420-452, are worth perusal. Of thirty specimens obtained by Hume, five were from Delhi (Gurgaon ?). According to him *nigrolutea* is a species with a defined area. Mr. Stuart Baker (*Fauna of British India* Birds,

Ægithina nigrolutea.—(*contd.*)

vol. i, p. 344) states that this species 'takes the place of *Æ. t. tiphia* and *Æ. t. humei* to the north-west of India', overlapping the range of both in certain parts of India. Wing of four specimens 62–66 mm.

Molpastes hæmorrhous pallidus (Stuart Baker). The Central Indian Red-vented Bulbul.

Common. Seen along with *M. 1. leucotis*. Writing from the neighbourhood of Delhi, Mr. F. R. Blewitt says: 'This Bulbul breeds from the middle of May to about the middle of August.'

[Eggs taken by Bingham. April–July.]

The notes in the new edition of the *Fauna of British India* regarding the *hæmorrhous* Bulbuls are not quite clear. Two specimens obtained belong to this pale race. My identification has kindly been confirmed by Mr. Whistler.

Molpastes leucotis leucotis (Gould). The White-eared Bulbul.

Also very common. This species and the last-mentioned are often seen together. Mr. Jones tells me that this species does not occur in the Amballa District.

Sitta castaneiventris castaneiventris (Frank.). The Chestnut-bellied Nuthatch.

Collecting as I did chiefly in babool jungle and wasteland, I did not meet with this Nuthatch whose haunts are shady groves and gardens. Cole tells me that he saw it on several occasions in the Kudsia Gardens. He obtained a ♀ on December 11, 1924, and this specimen I have seen.

Dicurus macrocercus macrocercus (Vieill.). The Black Drongo.

Very common everywhere, and, I think, a resident species.

[Eggs taken by Bingham. May to (?) August.]

This species breeds much earlier, I think, in Delhi, for I remember seeing a nest towards the end of March (1922).

Salpornis spilonota (Frank.). The Spotted Grey Creeper.

There is an old record of a nest found by Mr. Cleveland at Hattin, in the Gurgaon District, on April 16.

Acrocephalus dumetorum (Blyth.). Blyth's Reed-Warbler.

A single specimen of what may have been this species was seen among babool trees on the Ridge on March 25, 1925. I much regret having missed the bird, which disappeared among the trees and bushes. As Dr. Ticehurst remarks, this species is more of a Tree-Warbler than a Reed-Warbler in its habits (*Ibis*, July 1922, p. 550). In Simla, when this Warbler passes through in May, it is found among bushes and trees. As I did not get the bird its exact identity is doubtful. The bird seen may have been *Hippolais rama*: in fact, Mr. Jones thinks this was probably the species. Both look much alike in the field, and I may have been mistaken.

Orthotomus sutorius sutorius (Forst.). The Indian Tailor-Bird.

Abundant. A very common garden bird.

[Eggs taken by Bingham. April–June.]

Cisticola juncidis cursitans (Frank.). The Rufous Fantail-Warbler.

Bingham writes: 'I have not yet observed this bird at Delhi.' He seems to imply that it is likely to be found there. I met with this peculiarly marked Warbler on only one occasion on February 21, 1925, when I was out after Sand-Grouse in the outskirts of Raisina. Marking down a spot where some Grouse had settled, I happened to pass through a small patch of grass about two feet long, when I disturbed a Warbler which was new to me. It flew some little height above the grass, immediately being lost to view when it dropped down among the yellowish brown grass. In trying to find this bird I flushed another which behaved in the same manner. I decided to watch the exact spot where a bird settled, and when one rose again I marked it sitting quietly at the base of some grass. This specimen I shot; but I was not able to find the second bird. The way in which the streaked plumage of this species blends with the grass among which it lives is remarkable.

Franklinia buchanani (Blyth.). The Rufous-fronted Warbler.

Another common species, especially among jherberry bushes on the Ridge. It is also commonly seen among babool trees. This Warbler has rather a distinctive song, which consists of a trill, followed by a triple note like *sirriget-sirriget-sirriget*. A ♂ shot on December 12, 1924, was breeding.

[Eggs taken by Bingham. October.]

Sylvia curruca affinis (Blyth.). The Indian Lesser Whitethroat.

Abundant. Always to be seen among babool trees, though it has also haunts low bushes. Its harsh note is always to be heard in babool jungle.

Phylloscopus collybita tristis (Blyth.). The Siberian Chiff-Chaff.

When out collecting along the Bela Road at the back of the Fort on March 8, 1925, a specimen (sex ?) was procured. Several were seen among the jhow bushes on alluvial land. Another specimen (a ♂) was shot on a Neem tree near the District Jail on the same date. Both specimens were in fat condition preparatory to migration.

Phylloscopus indicus (Jerd.). The Olivaceous Willow-Warbler.

A specimen (ad. ♀) was obtained in babool jungle on March 21, 1925. This species was also observed passing through on migration. Towards the end of March : I have no details of dates.

Phylloscopus humii humii (Brooks.) Hume's Willow-Warbler.

The note of this Willow-Warbler was heard throughout my stay. Unfortunately no specimens were obtained, but a specimen shot for me at Okla proved to be this species.

Phylloscopus nitidus nitidus (Blyth.). The Green Willow-Warbler.

Three or four were seen on March 21, 1925, in babool jungle on the outskirts of Raisina, and an ad. ♂ obtained. Noticed during March and April passing through on migration.

Prinia gracilis lepida (Blyth.). The Streaked Wren-Warbler.

The haunts, *par excellence*, of this Warbler appear to be long grass. I did not meet with it anywhere else. On February 7, 1925, numbers were seen, flitting from one clump of grass to another, at the back of the Old Fort.

There is an interesting account of the nidification of this species in Delhi by Colonel C. H. T. Marshall in *Nests and Eggs*, vol. i, p. 288.

[Eggs taken by Bingham. March.]

Prinia socialis stewarti (Blyth.). Stewart's Ashy Wren-Warbler.

Bingham says : 'At Delhi I have not yet found its nest. I once found in July three nests all attached together in a sort of triangle, but whether built by separate pairs of birds I cannot say. Only one nest contained eggs.' This is a very common species, affecting the same type of country as *Prinia i. inornata*. Like that species it loves to investigate clumps of long grass, bushes, etc.

Prinia inornata inornata (Sykes.). The Indian Wren-Warbler.

Abundant. A common garden bird. Flits from bush to bush making a curious snapping noise. In the hills *Suya crinigera crinigera* indulges in the same habit.

Lanius excubitor lahtora (Sykes.). The Indian Grey Shrike.

Common all over, but its chief haunts appearing to be the rocky Ridge. In *Nests and Eggs*, vol. i, pp. 307–308, there is an interesting note by Mr. F. R. Blewitt on his experiences of the nidification of this Shrike in Delhi. Resident.

[Eggs taken by Bingham. March--August.]

Lanius vittatus. (Valenc). The Bay-backed Shrike.

Undoubtedly the commonest Shrike in Delhi. Seen among babool trees along the roads. This Shrike is a good mimic. Several specimens collected, including a nicely marked juv. ♂ obtained on December 3, 1924. Blewitt has a note on this species in *Nests and Eggs*, vol. i, pp. 312–313.

[Eggs taken by Bingham. May–July.]

Lanius schach erythronotus (Vig.). The Rufous-backed Shrike.

Not near as common as either of the two Shrikes already mentioned. If it has any particular haunts, these appear to be thin babool jungle interspersed with long grass, and also large gardens. I have seen specimens in the grounds of Metcalfe House and the Secretariat. As we require more information about this Shrike, I may mention that I met with it on several occasions during my stay in Delhi. The first occasion on which I saw it was on November 25, 1924, on which date a single bird was seen in a clump of bamboo and flowering shrubs in the grounds of the Secretariat in Old Delhi. On December 4, 1924, I obtained a fine ♂ in an open patch of ground opposite my residence in New Delhi, and on the following day I procured a ♀ in the same place. These two birds must have been together. On December 19, 1924, another specimen was seen, and this bird was also found in the same locality. On January 16, 1925, a ♀ was shot for me. A month later, on February 17, 1925, I saw two of these Shrikes in thin babool jungle at Raisina, and I saw a specimen in the grounds of Metcalfe House on March 30, 1925, when I was collecting examples of *Pastor roseus*, bnt I have no record of this in my diary. Bingham found it breeding in June.

[Eggs taken by Bingham. One nest containing two eggs on June 3, in the Nicholson Gardens.]

Lanius cristatus isabellinus (H. and E.) The Pale Brown Shrike.

Uncommon. I met with this species as follows :—

(*a*) A single bird seen on November 10, 1924, was shot at but not obtained.

(*b*) Juv. ♀ obtained on November 26, 1924.

(*c*) Ad. ♀ obtained on February 1, 1925.

(*d*) A single bird seen on February 17, 1925.

(*e*) A single bird seen in open fallow land off the Bela Road near the Jumna on March 8, 1925. A friend and I had several long shots at it, but in the end it eluded us !

Tephrodornis pondicerianus (Gmel.) Wood-Shrike.

Rather common among babool trees, its curious plaintive crescendo notes attracting attention The north-western Indian bird has been separated by Ticehurst and called *pallidus* (*vide* B. O C., xii., p. 56). Without a good series it would be better to treat the Delhi bird binomially.

[Eggs taken by Bingham. Date not mentioned.]

Pericrocotus brevirostris brevirostris (Vig.). The Indian Short-billed Minivet.

About half a dozen birds seen on January 15, 1925, in a thick clump of babool trees at Raisina. No ad. ♂♂ in the black and red plumage were observed however. I was unable to obtain any specimens as my supply of twenty-two cartridges had run out. Two days later two more ♀♀ (or immature ♂♂) were seen in the same place, but the birds managed to elude me by disappearing among the trees. On March 14, 1925, three more were observed. Two specimens were shot, one of which could not be found. It is strange that I saw no red ♂♂.

Pericrocotus peregrinus peregrinus (L.). The Small Minivet.

Rather common. Two ♂♂ in first plumage obtained on the road to Okla on November 22, 1924. Two ad. ♂♂ on January 1925.

[Eggs taken by Bingham. Earliest nest on March 21.]

Pericrocotus erythropygius (Jerd.). The White-bellied Minivet.

This elegant little Minivet is not uncommon at Delhi. It is usually seen in small parties of about half a dozen birds. Seen pecking at weeds a foot or two high. A party of four or five birds seen on November 25, 1924, and three ♂♂ obtained, one of which, however, was too badly damaged for preservation. Another ♂ obtained on January 25, 1925, and another of the same sex on February 4, 1925. A solitary ♂ seen near the Jantar Mantar on January 24, 1925. I did not get a ♀ specimen.

Oriolus oriolus kundoo (Sykes.). The Indian Oriole.

I saw no Orioles in Delhi during my stay there.

[Eggs taken by Bingham. April–July.]

Sturnus vulgaris poltaratzskii (Finsch). Finsch's Starling.

This, I think, is the common race found in Delhi. At the commencement of winter this Starling is to be found in small parties, in twos and threes or even singly, but by the middle of February enormous flocks are to be seen settling in fields and open spaces. A decent series of Starling would probably reveal the occurrence of one or two other races besides *poltaratzskii*.

Pastor roseus (L.). The Rosy Pastor.

This beautiful Starling was not seen at all till the end of my stay in Delhi. They must have arrived during the third week of March, as the first birds I saw (a couple) were on March 3, 1925, and a friend told me of some he saw two or three days before. On March 25, 1925, I saw flocks of varying size flying about, and others were seen on peepul trees on the same date. On March 26, 1925, I went out after them securing three specimens. On March 30, 1925, I obtained three more, in the grounds of Metcalfe House near the Secretariat. Up to the time I left Delhi flocks were seen daily, flying north in the mornings and evenings. This species is generally supposed to regulate its migratory flight with the flowering of the cotton tree, and it is therefore worth mentioning that I did not once see a single bird on a cotton tree, though this tree was in bloom at the time that the birds were found in Delhi. Four specimens were shot on trees bearing small green berries (I do not know the name of the tree). This tree appears to be the favourite resort of Rosy Pastors, the peepul also being frequented for its fruit, but not to such an extent. The song of this species consists of a jumble of harsh grating noises, intermingled with some really tuneful notes. In the field the presence of the birds may be known at once from the clamour they make. The long black feathers on the head and throat of a bird in full plumage stand out prominently when the bird is calling.

The colours of the soft parts are as follows :—

Fully adult birds in the pink and black plumage.

Irides—very dark brown, almost black.

Bill—fleshy, with the tips and culmen brownish, the base of the lower mandible blackish-plumbeous. Inside of mouth plumbeous posteriorly, pink anteriorly.

Legs and feet—brownish-yellow, tinged fleshy.

Claws—blackish-brown, with pale bases.

Birds in immature plumage.

Irides—As above.

Bill—pale flesh, with tips and culmen dark horny-brown, and base of lower mandible dull yellow. Inside of mouth dull yellow tinged plumbeous, with anterior portion of inside of both mandibles fleshy.

Legs and feet—dark-brown.

Claws—blackish-brown, without pale bases.

Temenuchus pagodarum (Gmel.) The Black-headed Myna.

This elegant little Myna was seen in pairs or in small parties in thin babool jungle and in other suitable localities.

[Eggs taken by Bingham. May–July.]

Acridotheres tristis tristis (L.) The Common House-Myna.

Abundant. Resident.

Acridotheres ginginianus (Lath.) The Bank Myna.

Common. Often seen attending grazing cattle. Numbers of these Mynas are to be seen at the Delhi railway station and at other stations on the line towards Ambala. They seem, in fact, to take the place of *A. t. tristis* at the railway stations.

Sturnopastor contra contra (L.) The Pied Myna.

This species is found bathing in the evenings along with *Acridotheres t. tristis*. It seems by preference to haunt country in the vicinity of water, and although a common species, is not usually found elsewhere.

[Eggs taken by Bingham. May–July.]

Siphia parva parva (Bechst.). The European Red-breasted Flycatcher.

A ♂ seen on January 11, 1925, in a large peepul tree in the grounds at Okla. Quite a number seen in babool jungle on March 22, 1925, on which date a ♂ and two ♀♀ were obtained. These were hawking insects among the trees. The note of this species is a *chit-trr* and is much like that of *Cyornis superciliaris*, but decidedly softer. ♀♀ appeared to be far in excess of ♂♂. A pair seen on March 26, 1925 and the ♀ obtained.

Stoparola melanops melanops (Vig.) The Verditer Flycatcher.

Miss Holmer in her book entitled *Indian Bird-Life* states that she has seen this Flycatcher in 'kikar jungle in New Delhi.' I did not meet with it.

Culicicapa ceylonensis ceylonensis (Swains.) The Grey-headed Flycatcher.

The note of this little Flycatcher was heard emanating from a clump of neem trees on the Okla road. No specimens obtained.

Terpsephone paradisi paradisi (L.) The Indian Paradise Flycatcher.

I did not see this species, and it had not arrived before I left Delhi.

[Eggs taken by Bingham. Seven nests on May 27, and June 12.]

Rhipidura aureola aureola (Less.) The White-browed Fantail Flycatcher.

Commonly seen singly or in pairs in babool jungle along roadsides.

[Eggs taken by Bingham. July 8.]

Saxicola caprata bicolor. (Sykes). The Northern Indian Pied Bush-Chat.

Common among bushes and shrubs in waste-land.

I obtained a nest at Kingsway towards the end of March 1922 containing four eggs.

[Eggs taken by Bingham. May-June.]

Saxicola torquata indica. (Blyth.). The Indian Bush-Chat.

Not quite as common as the species last mentioned, but, of course, haunting the same kind of ground.

Oenanthe picata (Blyth.). The Pied Chat.

Fairly common. Not infrequently seen on the roofs of houses and on walls. Far more ♂♂ than ♀♀ seen. Dr. C. B. Ticehurst noticed this same phenomenon in Lower Sind, but is unable to offer any reason for it. (*Ibis*, 1922, p. 633). I did not obtain, or even see, any specimens of the *capistrata* form of this species, though I kept a very sharp look-out for it. This is probably a distinct species or subspecies, rather than a dimorphic form of *Oe. picata*.

Oenanthe isabellina (Cretzsch). The Isabelline Chat.

Several pairs of what I took to be this species were seen on fallow land near the Hauz Khas on December 28, 1924. A stiff breeze was blowing that day and I tried several shots without success. A single bird seen on February 21, 1925, in bare, open ground, interspersed with a few thorny bushes and deep dry drains. This bird was far too wary and I did not get it. Four winters ago I saw this species in fields near Kingsway, but on two occasions when I visited this locality in 1924-25 I did not meet with a single Chat of this species.

Cercomela fusca (Blyth.). The Brown Rock-Chat.

Very common among piles of stones, and in rocky ground; also a most domesticated species, coming right into the house, and perching in the early mornings on the tops of windows, etc. This bird is a good mimic. I have heard it imitate the plaintive notes of *Tephrodornis pondicerianus*, *Tringa ochropus* and one or two other species.

[Eggs taken by Bingham. March-August.]

Phoenicurus ochrurus phœnicuroides. (Moore). The Western-Indian Redstart.

Very common, especially among babool trees on which it perches freely. Seen throughout my stay in Delhi.

Cyanosylvia suecica pallidogularis (Zarud.) The Eastern Redspotted Bluethroat.

Haunts bushes and scrub-jungle close to water, and clumps of plants in gardens. Two ♂♂ and a ♀ belong to this race.

Saxicoloides fulicata cambaiensis (Lath). The Brown-backed Indian Robin.

Abundant everywhere and a very common garden bird. A nest with three eggs found in a hole in a mound at the foot on a bush on March 22, 1925. Another nest built (no eggs) in a crevice in an old tomb March 29,1925. Several pairs were seen towards the end of March carrying food to the young.

[Eggs taken by Bingham. March-June.]

Copsychus saularis saularis. The Indian Magpie-Robin.

A common bird on the Ridge and in shady groves and gardens ; but not very prominent on account of its somewhat retiring habits. A pair used to haunt the grounds at Okla.

[Eggs taken by Bingham. May-June.]

Turdus atrogularis. (Temm.). The Black-throated Thrush.

I remember seeing two or three specimens of this species, which I know well from my experience of Simla birds, two or three winters ago in Delhi. Unfortunately no specimens were shot then ; but a fine ♂ was obtained on February 14, 1925, in the thick babool clump where I met with *Pericrocotus b. brevirostris* a month earlier. Not common.

Monticola solitaria pando (Sykes.). The Indian Blue Rock-Thrush.

Not very common. A single bird or a pair may be seen among piles of stones and bricks. Only one ♂ obtained on November 13, 1924. A pair used to haunt the new Secretariat buildings at Raisina.

Ploceus phillipinus phillipinus (L.). The Baya.

Old nests seen on babool trees. A flock of about twenty birds seen on December 6, 1924, and two specimens obtained, an ad ♂ and unsexed bird. Three or four seen among long grass at the back of the Old Fort on February 7, 1925.

Ploceus bengalensis. (L.). The Black-throated Weaver-Bird.

The British Museum catologue mentions a ♀, dated March 25, in the Hume collection.

Ploceus manyar flaviceps. (Less). The Indian Striated Weaver-Bird.

I did not get any specimens of this Weaver.

[Eggs taken by Bingham. July-September.]

Uroloncha malabarica (L.). The White-throated Munia.

Observed in small parties among long grass and thin babool jungle. This Munia is also very common among the thorny bushes on the Ridge, and seems to have a partiality for the kikar in which it builds its large globular nest. Cole found a nest in a kikar on November 14, 1924, with five slightly hard-set eggs. A note by Blewitt is quoted in *Nests and Eggs*. vol. 11, p. 139.

[Eggs taken by Bingham. February-September.]

Amandava amandava amandava (L.). The Indian Red Munia.

Seen in small parties among long grass along the canal banks at Kingsway and in other suitable localities where there is long grass. Three specimens obtained are all ♂♂.

Erythrospiza githaginea crassirostris (Blyth.). The Eastern Desert-Finch.

It is worth nothing that this species has been obtained in the Gurgaon District near Delhi. Hume records the following note in *Stray Feathers*, vol. vii, p. 454 :

'Mr. E. W. Cleveland sends me a beautiful specimen of *Bucanetes githagineus*, which he shot near Hattin in the Gurgaon District (Punjab) on December 16, 1877.

'No doubt the bird occurred here, as Mr. Cleveland remarks, as a mere straggler, but still its occurrence so far east is most remarkable. When I discovered it years ago in Sindh, this was an enormous extension eastwards of its range (which westwards stretches to the Canaries).

'Again, last year, when I shot it at Jodhpoor, we had a further easternly extension, and now this new locality extends the range to the 78° E. Long.'

Carpodacus erythrinus roseatus. (Hodgs). Hodgson's Rose-Finch.

A pair obtained on January 24, 1925, in thin babool jungle near the Jantar Mantar. The ♀ was first noticed perched on a low branch and was shot. I then made a search for the ♂ which I suspected must be nearby. I soon discovered him and shot him also. On January 31, 1925, I saw a party of about eight or ten birds feeding on the ground in a patch of babool trees, and secured another fine ♂. The only previous record of the occurrence of this species in Delhi appears to be ♀ dated April 2, 1872, in the Hume Collection—*vide* Mr. H. Whistler's ' Note on the Weavers and Finches of the Punjab.' (J.B.N.H.S., vol. xxx, p. 186).

Gymnorhis flavicollis (Frank). Yellow-throated Sparrow.

Observed first in a small party from which a bird was obtained. This was on November 13, 1924. Later on I got a soiltary ♂ on February 5, 1925, and on March 7, 1925. I obtained two birds separately. On March 23, 1925, a pair was seen perched on railing on the roadside. Others were seen from time to time. This species is not at all uncommon in Delhi. The presence of this Sparrow may be detected in the field by the prolonged twittering notes of the bird which remains perched in one place for quite a long time while it keeps on twittering. The notes are like those of *Passer d. indicus* but softer and sweeter in tone. The colour of the bill in winter is variable : it may be either dark brown or black. Specimens collected appear to be intermediate between *transfuga*, and *flavicollis* and agree with examples obtained by Mr. A. E. Jones at Amballa. Please see in this connection Mr. Whistler's notes on this species (J.B.N.H.S., vol. xxx, p. 411).

[Eggs taken by Bingham, June.]

Passer domesticus indicus. (Jard and Selby). The Indian House-Sparrow.

Abundant. Resident.

Emberizinæ. Buntings.

A small party of birds seen in the evening among the reeds at Okla on January 11, 1925, and apparently about to roost there, may have been Buntings of some sort. It was impossible to obtain specimens, however, and the species must remain in doubt. Although I watched for Buntings and visited all likely spots, I was unsuccessful in getting any specimens.

Emberiza cia per. (Hart.) The Transcaspian Meadow-Bunting.

Cole obtained a ♂ on February 24, 1925, on the Ridge at Kingsway. This was the only one seen by him.

Riparia brevicaudata (McClell.) The Indian Sand-Martin.

Found breeding in colonies towards the end of November and in December, January and February. A pair obtained on November 16, 1924. Several holes were opened up on December 13, 1924, but held no eggs. Cole obtained eggs as follows :—

(*a*) February 2, 1925. Colony of eight nests. Three nests with four eggs each.

(*b*) February 6, 1925. Colony of four nests. Two nests held three and four eggs each.

(*c*) February 26, 1925. Four nests, all with young.

[Eggs taken by Bingham. January-May and October-December.]

Ptynoprogne concolor (Sykel.). The Dusky Crag-Martin.

Some Crag-Martins, which, I think, must have been of this species, were seen flying about near the Old Fort on February 7, 1925.

Hirundo rustica gutturalis. (Scop.). The Eastern Swallow.

Seen flying over grassy plots along with *daurica* Swallows and *Riparia brevicaudata* towards the beginning of November. Later on these Swallows were not seen so prominently. An ad. ♂ and an unsexed juv. were obtained on November 10 and 11, 1924, respectively. In the field this species is easily recognized by its pinkish underparts and the dark patch on the throat. The specimens obtained seem to be intermediate between typical *rustica* and *gutturalis*.

Hirundo daurica erythropygia. (Sykes.). Sykes's Striated Swallow.

I found a nest with young on March 14, 1925. in a small ruined tomb in babool jungle at Raisina. In the dome of the same tomb several pairs of *Micropus a. affinis* were also nesting. A single egg was once brought to me by a small boy.

[Eggs taken by Bingham. March-June and September.]

Hirundo daurica nepalensis. (Hodg.). Hodgson's Striated Swallow.

A specimen (unsexed) obtained on March 8, 1925. On which date three or four were seen perched on telegraph wires along the Bela Road. It is not easy to differentiate between this sub-species and *erythropygia* without shooting specimens.

Hirundo daurica striolata (Temm. and Sch.). The Japanese Striated Swallow

On the morning of November 16, 1924, I saw numbers of Swallows of the *daurica* type perched on telegraph wires at the back of the Secretariat in Old Delhi. An ad. ♂ obtained has the striations on the lower parts very coarsely marked. It is also a large bird. It appears to be a specimen of this race, though the distribution does not normally extend so far west. Mr. A. E. Jones has compared this bird with a fair series of the commoner *daurica* Swallows in his collection, but cannot match it.

This specimen has very kindly been sent by Mr. Whistler to Dr. Ticehurst for identification.

Measurements. Wing 122 mm. Tail 120 mm. Depth of fork 68 mm.

Hirundo smithii filifera (Steph.). The Wire-tailed Swallow.

This species builds under culverts and bridges above water. Some winters ago I saw nests at Kingsway. I was told of some Wire-tailed Swallows seen on the telegraph wires along the Bela Road, but I visited the place two or three times without success. No specimens were collected. Some birds were seen on April 3, 1925.

[Eggs taken by Bingham. April-May.]

Motacillidæ. Wagtails.

Wagtails were exceedingly common when I first arrived in Delhi, and continued to be so till the middle of February. I made the mistake which seems to be difficult to avoid, viz., omitting to collect a sufficient number of specimens of a common species till one realizes it is too late to make up for lost ground. The result was that I got hardly any Wagtails. The only species I am able to record with certainty are enumerated below. From about the middle of March large numbers of Wagtails are to be seen flying over on migration in the evenings. Hundreds of birds may be watched passing over in a continuous stream. The direction appeared to be N. W. or W. N. W.

Motacilla alba dukhunesis (Sykes.). The Indian White Wagtail.

This was the commonest species during the winter. It remained behind till after *M. feldegg melanogrisea* had left. Stray birds were seen in grassy plots and open ground till the very end of my stay in Delhi, though no other species were observed except in flight on migration. A specimen obtained on March 21, 1925, is in very heavy moult.

Motacilla maderaspatensis (Gmel.). The Large Pied Wagtail.

The classification of this Wagtail in the *alba* group seems incorrect. I am inclined to agree with Dr. Ticehurst that, for the reasons given by him (J.B.N.H.S., vol. xxviii, p. 1090) this species should be kept apart from the White Wagtails. I did not see this large Wagtail anywhere else except at Okla and at Kingsway. In the latter place, I found a nest under a low bridge near Shah Alam's Tomb, on February 27,1922. The nest held three fresh eggs which I took.

Motacilla feldegg melanogrisea (Hom.). The Black-headed Wagtail.

This species was common enough up to the middle of February. Birds were generally to be seen in open spaces, in fields, near patches of water and in gardens. In winter most birds are a dingy, brownish colour ; in March some green begins to show on the upper parts and the lower plumage shows indications of turning yellow, and by the end of March numbers of birds in full

Motacilla feldegg melanogrisea—(*contd*.)

breeding plumage are to be seen. This Wagtail perches freely on trees and telegraph wires. The note is a penetrating *queegik*, *queegik*. A ♂ specimen shot on February 6, 1925, is beginning to assume the summer plumage, and a fine ♂ shot on March 8, 1925, is in full breeding dress.

Anthus trivialis trivialis (L.) The Tree-Pipit.

Common throughout my stay. One greenish specimen appears to be of this race, not being near as green as typical *maculatus* with specimens of which it was compared.

Anthus campestris griseus. (Nicoll). The Eastern Tawny Pipit.

The first specimen was obtained by my brother who shot a ♂ on November 10, 1924. The next day he shot two more. This species is to be found in open country covered with short grass, on large open *maidans*, lawns, etc. On February 7, 1925, I saw some Pipits which were probably of this species on the lawns in the Old Fort. The specimen shot on November 11, 1924, is the palest obtained, while the ♂ shot on the previous day is inclined to be rufous on the upper parts and tail. The colours of the soft parts are as follows :

Irides—brown.
Bill—Upper mandible brown to brownish-black, lower mandible fleshy.
Legs and feet—fleshy.
Claws—pale horny or fleshy brown.

Anthus richardi rufulus (Vieill). The Indian Pipit.

On March 7, 1925. I obtained a Pipit (which could not be satisfactorily sexed) which has a whitish throat and is of smallish size. This bird I could not identify. Mr. Whistler has been good enough to examine it carefully and is satisfied that the bird belongs to this species. In this specimen the wing measures 85 mm., and the hind-claw 8·5 mm.

Anthus sordidus subsp. (Finsch.) The Brown Rock-Pipit.

This large Pipit first came to my notice on November 29, 1924, on which date a ♀ was shot for me. No more were seen for some little time. On January 6, 1925, I was taken to a place where some more birds had been seen. Although *Anthus hodgsoni* was found in numbers, none of the larger species was met with. On February 14, 1925, I discovered a spot where there were several birds. This was a fairly open grass-covered stretch, interspersed with thin babool jungle and jherberry bushes. About half a dozen Pipits were seen, and a specimen (which could not be sexed) was obtained. On February 17, 1925, I again visited this place and obtained two more specimens—both ♂♂. I saw this Pipit from time to time till the end of my stay. I would not regard this bird as rare in Delhi. The fact of the matter is that it frequents country of the kind described and is therefore not usually seen except in such haunts. It is always found on the ground, rising suddenly from near one's feet if not noticed ; but running quickly along the ground, taking cover behind tufts of grass, clods of earth, etc., if followed up. It frequently perches on large exposed rocks, and also on bushes and trees, I did not, however, observe it wagging its tail in the slow manner of *Anthus t. trivialis*. The note is a soft *plip*, *plip*. The colours of the soft parts are as follows :—

Irides—dark brown.
Bill—Upper mandible dark horny brown, lower mandible pale yellowish-white with dusky tip.
Legs and feet—pale brownish-yellow.
Claws—brown.

The ♀ shot on November 29, 1924, has more rufous in the lower plumage than the other specimens, and the unsexed bird obtained on February 14, 1922, has the dark-brown streaks on the breast most distinct.

Wing 95–99 mm. Tail 84–86 mm. Hind-claw 9–10 mm.

Calandrella. Short-toed Lark.

On three or four occasions I met with flocks of some small birds in bare, open country, where such species as *Pterocles s. erlangeri*, *Cusorius coromandelicus*, etc., are found. The birds were exceedingly wary, however, and I could never get close enough to shoot any with my ·22 bore or collecting gun. Flocks were also met with in ploughed fields. The birds seemed rather

Calandrella—(*contd.*)

restless, wheeling about and settling on the ground to feed, then suddenly flying off again and after a few wide circles settling on the ground once more. These little birds were probably *Calandrella* larks.

Alaudula raytal raytal (Blyth.). The Ganges Sand-Lark.

Cole obtained a specimen near the riverside on November 26, 1924.

Mirafra erythroptera (Jerd.). The Red-winged Bush-Lark.

This Bush-Lark is found commonly all over Delhi. It is generally seen singly or in pairs, crouching on the ground near a tuft of grass, a bush or clod of earth. When disturbed it often flies on to a tree or bush.

[Eggs taken by Bingham. One nest found on the Ridge on September 21.]

Galerida cristata chendoola (Frankl.). Franklin's Crested Lark.

Common in open country, in fields, etc. Has rather a plaintive note.

[Eggs taken by Bingham. Two nests, on March 31 and April 23.]

Pyrrhulauda grisea grisea (Scop.). The Ashy-Crowned Finch-Lark.

Common in dry, sandy ground. Seen on the footpaths of the more open roads on the outskirts of Raisina and on bare ground near the new Secretariat. Three ad. ♂♂ obtained on March 14, 1925. One of these is curiously deformed. There is no foot on the left leg, which terminates in a hard, horny process ! This bird did not apparently suffer much on account of its malformed foot, for it moved about on the ground just as easily as other birds and it was not until it was shot that the deformity was noticed. Two ad ♀♀ secured on March 18, 1925, in front of the new Secretariat at Raisina. A juv. bird was caught alive on March 17, 1925. It lived for a day and I made it into a skin when it died. Mr. S. C. Law has given a full description of the song-flight of this peculiar Lark (*Ibis*, 1924, pp. 645–647). A low, churring note is also uttered when the bird is seated on the ground.

Zosterops palpebrosa elwesi (Baker). The Western White-eye.

Heard throughout my stay. No specimens obtained, but the birds must have been of this race.

[Eggs taken by Bingham. May–July.]

Cyrtostomus asiaticus asiaticus (Lath.). The Purple Sun-bird.

Abundant. The very first bird collected on the day of my arrival was a ♂ in undress plumage. A series of seven ♂♂ was obtained with the object of ascertaining whether the purple dress is a seasonal change of plumage assumed during the breeding period, or whether it is merely the fully adult garb acquired after some time, and which when once assumed, is not lost again. A careful examination of the skulls of the specimens I shot showed them to be adult birds. I also noted carefully that all ♂♂ seen during the months of November–December and the first few days of January lacked the full purple plumage ; whereas, several ♂♂ were in purple plumage by the first week of February, and by the middle of that month hardly a specimen was seen in undress. The first purple ♂ was seen as early as January 4, 1925 ; but along side it, on the same flowering shrub, was another ♂ in undress. This leads me to think that the purple plumage is seasonal. There is a note on this subject by Dr. Ticehurst in the *Ibis* (1923, p. 24). Breeds commonly in March. Nests usually suspended from the thorns on the fleshy leaves of the cactus. Of six ♂♂ measured, three have the bill 19 mm., and three 20 mm. (Measured from gape).

[Eggs taken by Bingham. March–May.]

(*To be continued*)

TAKIN SHOOTING IN THE SPRING

BY

E. MAXWELL WEST

(*With a plate*)

It is four o'clock in the morning and bitterly cold as you force yourself half out of the blankets to drink your morning tea. That biting wind, which springs up just before dawn to herald the sun, is whistling through the thin walls of the bamboo hut and you wonder why you ever took up big game shooting and resolve, on your return to civilization, to sell your rifles and go in for poodle-faking or some less exacting pastime which does not involve living in the 'blue', rising by lamp light and being frozen withal.

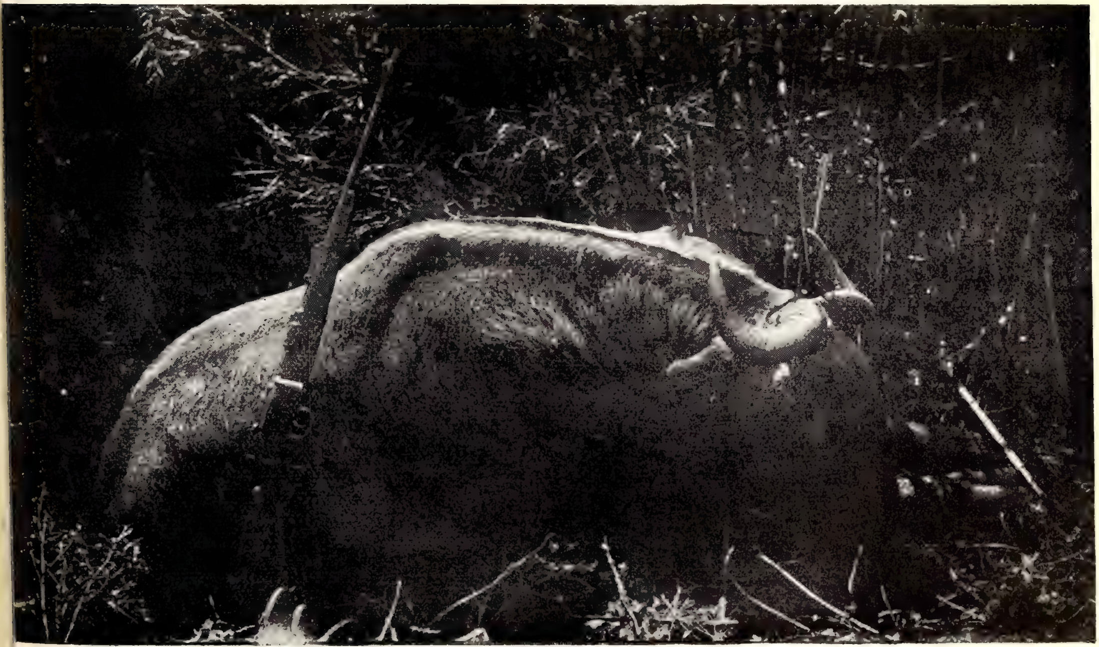
Camp is at 11,000 feet, and at this hour, as you tramp up the hill, the deodar and rhododendron forest with its undergrowth of bamboo all festooned with moss and with drifts of snow in every hollow presents a dismal picture. Presently, however, as the first rays of the sun strike through the interlacing branches, the scene is transformed, and, incidentally, your former depression vanishes.

From a dark and gloomy vista of greys and blacks you find yourself, as if by magic, in an enchanted forest. The dawn brings out the scent of the rhododendrons and magnolias which carpet the ground with their fallen blossoms in patterns of pink, scarlet and white. A thousand points of light shine from the dew-drenched greenery, and the moss, which previously had such a depressing effect, now appears like hangings of jewelled lace.

The wind has now died away and the breathless stillness which prevails is suddenly broken by the sound of, surely, a flute. As you halt the notes are repeated and amid a shower of sparkling dew, a Tragopan drops from his roost in the trees, a vision of grey, spotted crimson and blue. His upright blue horns and flute like call remind one irresistibly of Pan and his pipes, but this is a Temminck's Tragopan, only to be met with on these far frontier hills, and were it not for the thought of possible Takin higher up, sentiment would be dismissed and he would be added to the bag. The Yawyin guide, however, cannot understand your forbearance and by his excited gestures urging you to shoot, soon removes any chance of your doing so by frightening the bird away.

As you reach the higher levels the forest thins out, the rhododendron, magnolia and bamboo being replaced by larch, juniper and dwarf rhododendron, while blue gentian stars the more exposed spaces from where the snow has melted. Again you are startled by a strange call and catch sight of a smallish bird in a livery of apple-green grey and scarlet, as he runs up the hill. This is the Blood Pheasant, a beautiful bird, but from the sportsman's point of view annoying, as he never rises and has to be shot running.

TYPICAL TAKIN COUNTRY



THE END OF A PERFECT MORNING

At last you reach your objective, the open grassy slopes from which the snow has almost all melted, and where you hope to find the Takin. Here you stop for a well-earned rest and to search the hills around with glasses, but before you sit down pull on the sweater which your guide has carried, for it was hot work climbing that last five hundrd feet, and here, at over 12,000, in spite of the sun, you will soon be chilled.

It is a wonderful scene. A wide semi-circle of black cliffs picked out with patches of dazzling snow show up clear cut against the brilliant blue of the sky, sinking towards the centre to a col, which is the pass into China. The grassy slopes you are on are relieved here and there by clumps of deodar and pine in black silhouette on the unmelted snow, while beneath stretches the dark forest from which you have just emerged. Far below again, in the green jungle clearings are a few scattered hamlets of the Yawyins, the mountaineers of this frontier.

As you sit here in the midst of Nature's grandeur drinking in the champagne-like air, you wonder at your heretical thoughts of two hours ago, and pity the poor misguided fools who spend their leave in a round of gaiety, long nights and short drinks, at popular hill stations. This feeling of exaltation of being removed from the world of dull care and monotonous routine, of being in part with Nature, is worth living for. You feel that God is near . . . .

A rattle of stones above you breaks into your reverie. You slowly turn your head, and behold, the Devil? . . . No! at long last you have found the Takin, or rather he has found you, for suddenly coming over the ridge above you he sees something strange and stops to stare. He is not unlike the Devil with his large Roman nose, sharp black horns and large cloven hoofs.

Not a move now or he will be off. After what seems an age he turns his head to look for his companions. Now is your chance. Slowly you bring the rifle forward and get a sight on to the point of his shoulder, when he again turns to stare at these strange intruders. His curiosity is his downfall and as the report of your rifle is thrown back from the cliffs above, your first Takin lies kicking on the ground. After firing it is as well to jump to one side behind a rock if possible, as the Takin is reputed to live up to his appearance and charge anyone in sight when wounded, his business like horns, his size and considerable agility making him an animal not to be despised on a steep hillside.

This time however the bullet has done its work cleanly and well, and you scramble up the hill to view your trophy, but first take cover behind that rock and see if there is anything the other side of the ridge. Yes, not far below are three more of these strange animals, one good bull and two small ones. They have never heard a rifle shot before and do not know from which direction the danger comes, but steady now, and get your breath, for you may never see a Takin again. Once more the rifle shatters the stillness and the big bull drops, the youngsters disappearing at an amazing pace into the jungle below.

Forgotten are the weeks of fruitlessly toiling up and down the hills as often as not in snow and rain, with nothing to gladden your eyes but old tracks. Or if remembered for a moment you dismiss the thought as you look down on your hardly won trophies and around at the glorious panorama, now rendered doubly beautiful by your success.

And so we will leave you with your measuring tape and camera, and to enjoy a well-earned breakfast in the finest surroundings for which man could wish, while your guide drops down to the camp to bring up men for the final obsequies.

BIRDS NESTING WITH A CAMERA IN INDIA

PART *VI*

BY

CAPT. R. S. P. BATES

(*Continued from page 804 of Volume XXX*)

(*With 14 plates*)

In the plains of India the lot of the ornithologist on most occasions is far from being all that can be desired. From April till the end of September, the months of greatest activity amongst the resident feathered population, the discomforts of first the scorching heat of the early summer, next the humid and sultry days of the rains with their attendant and everchanging hordes of noxious insects, and lastly the final burst of heat before the cool weather sets in, are at times well nigh unbearable.

By those who have never braved the inside of a small hiding tent when the shade temperature is in the neighbourhood of 110°, or have never had occasion to spend hours at a time in a small open boat on a shadeless expanse of water, the attendant discomforts cannot be realized. For these reasons and the fact that I have only been able to devote myself to this work during the all-too-short and far-between periods of leave obtained during the late unsettled years, I fear my efforts with regard to the birds of the plains and the hills of continental India are most incomplete, even for the comparatively short time I have spent in the country.

However, though my photographic records are somewhat scant, I have indeed had the fullest value out of my exploits, and on going through the notes jotted down for the subject matter of this article, I find that, rather than impressions of the general habits of the birds dealt with, they are largely records of abnormalities, curious nesting sites, etc., and experiences at times annoying and unpleasant but all the same amusing when one looks back on them. This chapter therefore might more aptly have been headed 'Abnormalities of Indian Bird-Life' or 'The Foolishness of being an Ardent Ornithologist'.

I first conceived the idea of making bird photography my hobby when stationed in a native state in Rajputana, with rather more leisure than one now has in the post-war army. Peafowl were an absolute nuisance and being sacred one was not allowed to impress upon them with a charge of shot that they would be the more welcome if only seen and not heard, with the result that they were so tame that they even used to come into the compound, and, if anything disturbed them during the night, one would be rudely awakened by piercing yells from their roosting places in the large trees around the bungalow.

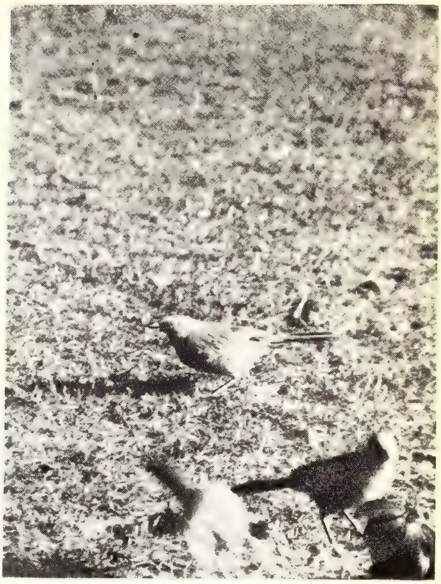
I discovered one morning that a Peahen had a nest in some long grass just the other side of a privet hedge and not more than 20 yards from the bungalow, so I sallied forth with all my paraphernalia to photograph it, and having set up the camera stepped behind it to start focussing. Unfortunately I put my foot in the very middle of a bees' nest, nasty little grey fellows which stuck to one like leeches. The camera flew in one direction, and I in a bee-line in the other. It really must have been a bee-line as they too folowed it, and incidentally me, in most unpleasant numbers. The remainder of that day I was somewhat unhappy and only ventured forth to collect my apparatus after sundown. A couple of days later I summoned up courage to try again, and approaching the nest from a different direction was disgusted to find nothing but some broken egg-shells.

Curiously enough, one of the first nests I found in Bharatpur, the said native state, was on the roof of the Bungalow and was that of a Brown Rock-chat (*Cercomela fusca*) whose confiding ways and sweet subdued little song soon attracted my attention. The nest was in a curious spot, being built inside an old nest of a Syke's Striated Swallow, the tubular entrance to which had somewhat crumbled away. I succeeded in getting quite a pleasant photograph including the bird standing on the ledge above the nest. Later on the same pair made two attempts to raise a second brood: the first of the two quite close to the old site in a crevice in the wall below a window sill, and the second on a shelf actually inside the lamp room, a small room at the back of the Bungalow with a single barred window without glass. When this latter nest was almost complete, some ass of a servant swept it away. These confiding little birds were very common in Bharatpur, and as they have a very misguided preference for human propinquity, almost every bungalow had its lodgers. The nests, I noticed, were rather untidily put together, and had little in the way of lining. The eggs were in no way unusual, being pale blue green with small reddish spots mostly around the larger end; unspotted eggs I never came across. I wonder why this chat should ape Robin Redbreast? Perhaps it is because it rather resembles it in plumage, much more so, in fact, than do the Indian Robins, and having realized this fact and seeing that the Robins are far from familiar, it may think that it is up to it to do its best to fill the gap in the heart of every new arrival from Home who longs for anything English.

The Rock-chats were not alone in choosing weird places for their nests. Stranger than the above was the situation of a Yellow-throated Sparrow's (*Gymnorhis xanthocollis xanthocollis*) nest. This little bird is just what an aristocratic House Sparrow should be but is not--well mannered, quiet, and not too familiar.

It approximates to the female of that species in appearance, but has a rather long and slender bill, the distinctive pale yellow throat-patch, and for nesting sites largely patronizes holes in trees and, although found round about habitations, is also addicted to scrub jungle and fairly open country. Still, one of the strangest of nesting sites was that chosen by a pair of these birds close to the house. An iron gate, seldom closed, and situated but some

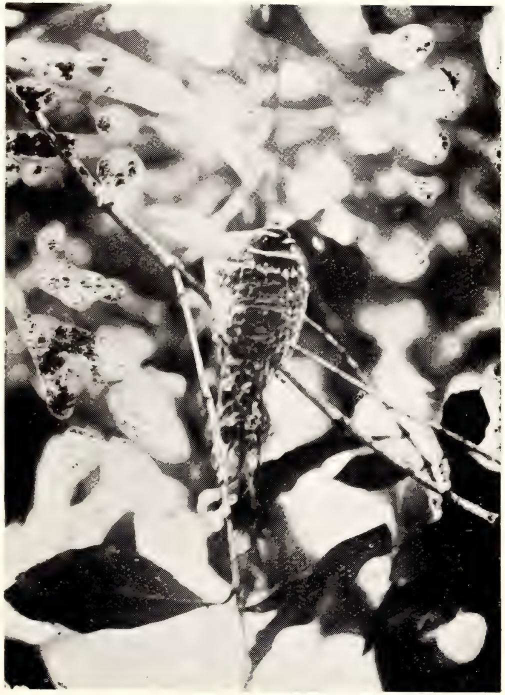
THE BROWN ROCK-CHAT
(*Cercomela fusca*)



THE LARGE GREY BABBLER
(*Argya malcolmi*)

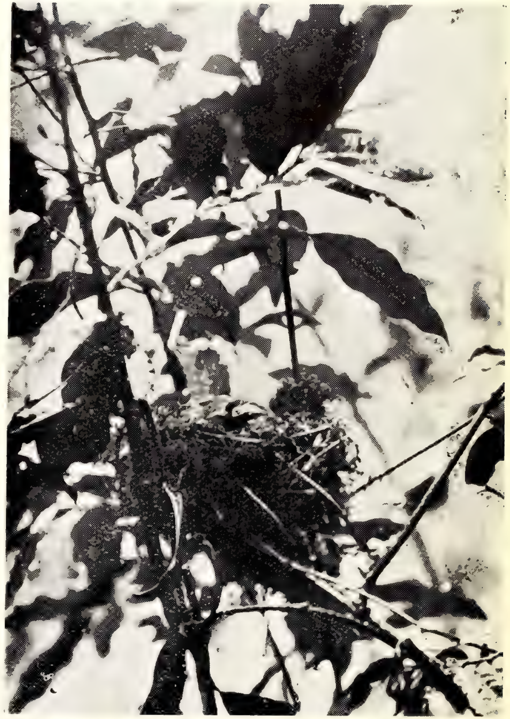
THE CEYLON RED-VENTED BULBUL
(*Molpastes hæmorrhous hæmorrhous*)

THE SOUTHERN INDIAN STONE-CHAT
(*Saxicola caprata atrata*)



THE WHITE-SPOTTED FANTAIL FLY-CATCHER
(*Rhipidura pectoralis*)

THE SOUTHERN RED-WHISKERED BULBUL
(*Otocompsa emeria fuscicaudata*)



THE NILGIRI LAUGHING THRUSH
(*Trochalopterum cachinans cachinans*)

15 yards or so from my bed-room door, led from the side of the compound into a field. The gate posts were of stone and through one of them a hole had been pierced for the bolt. This was certainly not more than 1½ inches in diameter on the outside and I very much doubt if it got any bigger inside, and certainly there did not appear to be room for the birds to turn, as I noticed that they invariably reappeared from the hole on the opposite side to that by which they had entered. This may, of course, have been merely due to habit. Unfortunately I find I have made no entry in my diary as to whether their efforts were crowned with success or not, and I cannot now remember what happened.

Only last year I struck another of these nests in nearly as strange and certainly a more unpleasant situation, namely in the top of a metal telegraph post on one of the rifle ranges near Madras. The diameter of the apex of a similar post lying close by, which also lacked its lid, I judged to be just about 2 inches. There were evidently hefty youngsters in the nest nearly ready to fly. It had been constructed some few inches down from the top, and how both the parents and young stuck it I don't know. The heat of the post at 8 a.m. was infernal, so what it must have been like by the time the sun had been playing on the metal for some hours I cannot possibly imagine.

However to return to Bharatpur, a further peculiar Yellow-throated Sparrow's nest was one in the old nesting hole of an Indian White-breasted Kingfisher (*Halcyon smyrnensis fusca*), an abode some two feet deep. This nest I opened up as it was only about nine inches down from the top of a sandy bank. There were four eggs in a small cup in a large and rather loose untidy collection of grass and feathers, the latter material greatly predominating. After photographing it, I roofed in the hole again with small slabs of stone which I discovered near by, covering these up finally with earth and sand, and had the satisfaction of seeing the birds carrying on quite happily. Some days later, however, the nest was raided and the eggs eaten, either by rats or some other of the many pests with which Indian birds have to contend.

More confiding than the above were the Bulbuls, two species of which lived in the compound, namely the Central Indian Red-vented Bulbul (*Molpastes haemorrhous pallidus*) and the White-eared Bulbul (*Molpastes leucogenys leucotis*). As the sun used to set behind the house, in front of which was a small lawn with a *nim* tree in its centre, I always had my tea out of doors, and it was not long before I had collected one or two acquaintances, the first to become thoroughly tame being a pair of Bulbuls of the former species, which soon took to descending on to the tea-table to peck at anything and everything which looked eatable. A White-eared Bulbul used to hang about the tree, but would not actually join in the repast except when I left the table and went into the verandah. Though I did everything I could to gain their complete confidence, I never succeeded in getting any of them to actually feed out of my hand, and had to console myself by ministering to the wants of a bold little tree-rat, who used to run up my leg to pinch bits of cake from off my knee.

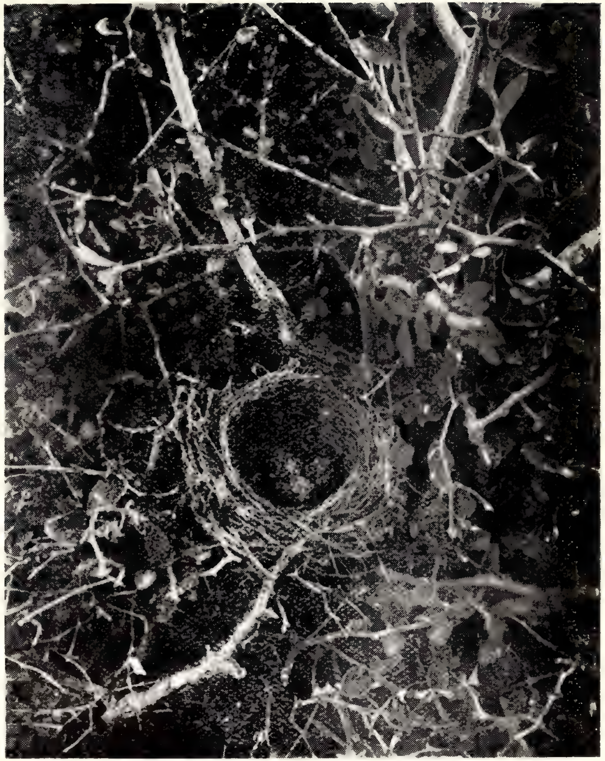
These two species of Bulbuls were excessively common, and one was always coming across their nests in almost every description of bush or sapling, the small prickly bushes at the back of the bungalow being especially favoured by the White-eared variety, which in Bharatpur very much outnumbered the Red-vented species. In the construction of their respective nests there was nothing to choose, both being pretty rottenly made thin-walled cups of bents, in comparison to which the nests of the Southern Red-whiskered Bulbuls in the illustrations here are most solid structures. It really does seem extraordinary that these cheery little birds should be so common when one thinks of the astonishing number of nests which are destroyed, many through the bird's own stupidity I'm sorry to say. I soon discovered that if I found a particularly interesting nest, even to put off photographing it till next day was exceedingly risky, the only safe thing to do being to return for the camera then and there.

Before long my tea parties were joined by a band of noisy seven-sisters—Large Grey Babblers (*Argya malcolmi*), and their advent might be termed the beginning of the end, as quarrelling at once became the order of the day between these people and the tree-rat family, which resulted in the complete discomfiture of the cheerful little Bulbuls, who evidently disagreed strongly with such unseemly behaviour. In the north these Babblers are exceedingly tame, whereas here in the south, and especially in the hills, these same birds particularly shun observation. In fact wherever I have struck them in the peninsula they cannot possibly be described as anything but rather shy skulking birds, which, though given to entering gardens and orchards, certainly resent being watched. I do not consider, however, that they are as shy as Mr. Douglas Dewar leads one to expect in his 'Birds of the Indian Hills'.

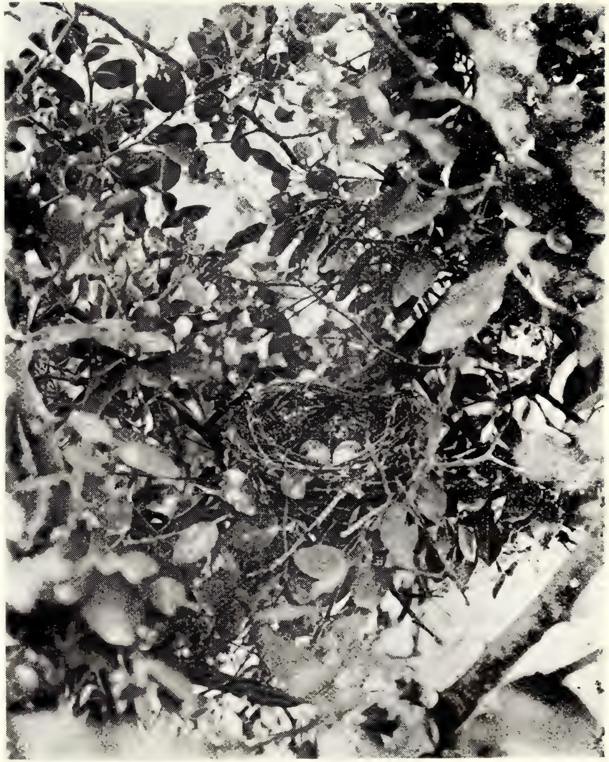
Besides this Babbler, the Common Babbler (*Argya caudata caudata*) used also to frequent the compound, and, in a thick tangle of creeper-like growth enveloping a piece of the fence bordering the railway line, I came across a compactly built nest, made chiefly of the thinner strands of the same material in which it was placed, and containing three eggs of the usual very glossy texture and deep spotless blue colouration.

To expound fully on every description of bird which was noted in the compound would fill a volume, but even a bare list of those others not yet mentioned, which I noted as of frequent occurrence during the whole or a large part of the year, is of decided interest, including as it does such widely divergent forms as Quails and Partridges (the Black and the Grey). Ibis, Nuktas, Spotted-billed Ducks, Sandpipers and Stilts, Paddybirds and Night Herons, during the floods, Paroquets, Hornbills, Tree-pies, Bee-eaters and Fly-catchers—the Paradise Fly-catcher and the White-browed Fantail—Rosy-backed Starlings and Mynas of various species, Sunbirds, Barbets and Golden-backed Woodpeckers, Crow-pheasants, Koels, Crows, Shrikes and King-crows, Munias, Weaver-birds and Wren-Warblers, Bush-chats, Finch-Larks, Pipits, Hoopoes, Rollers, Doves and Blue Rock Pigeons, and probably many others which at the moment I do not recall, and, of course, Kites, Scavenger

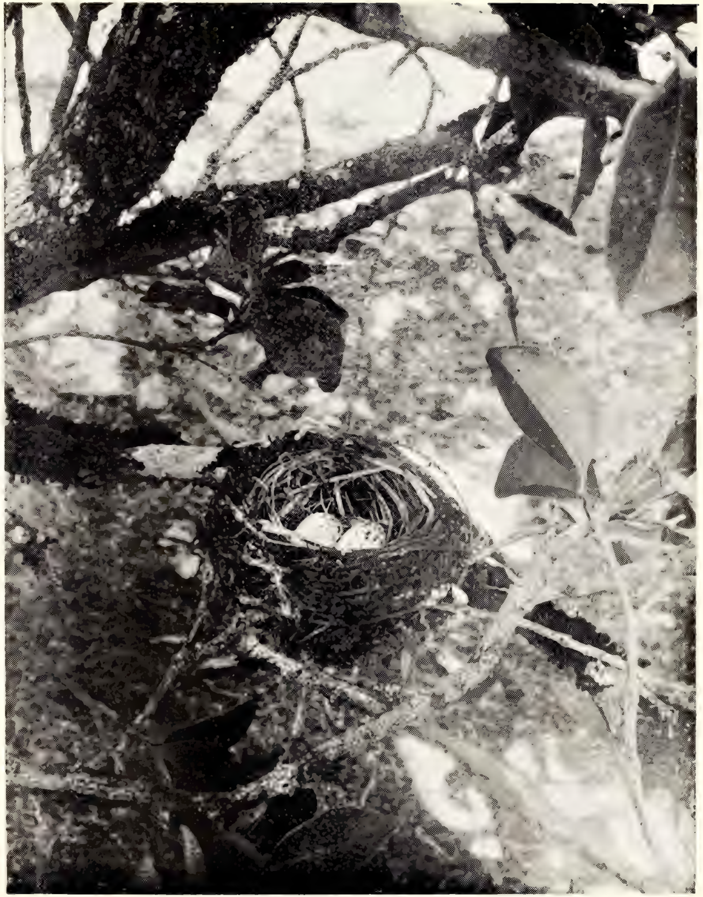
PLATE III



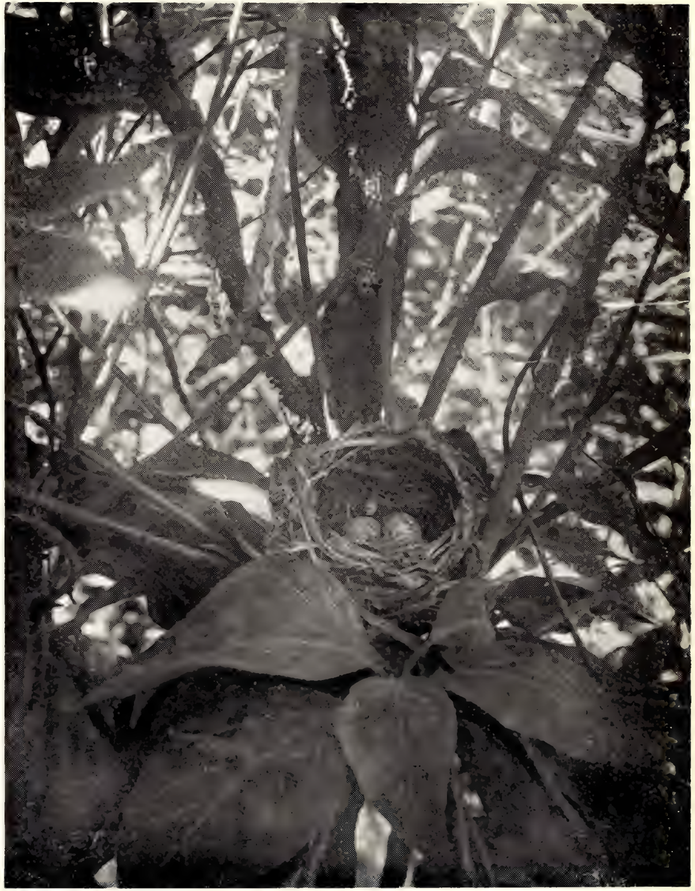
THE WHITE-EARED BULBUL
(*Molpastes leucogenys leucotis*)



THE CENTRAL INDIAN RED-VENTED BULBUL
(*Molpastes hæmorrhous pallidus*)



THE SOUTHERN INDIAN BLACK BULBUL
(*Microscelis psaroides ganeesa*)



THE SOUTHERN RED-WHISKERED BULBUL
(*Otocompsa emeria fuscicaudata*)

Vultures, an occasional White-backed Vulture and, on a couple of occasions at least, a King Vulture.

I don't suppose for an instant that this extraordinary variety of species could have been met with in any other garden in Bharatpur. It was largely due, of course, both to its constitution and to its position, as it was something like a mile from the city and considerably farther from any other bungalow, with the exception of the Moti Jhil, and had scrub jungle in front and to one side, and on the other side and rear cultivation. One face of the compound was bounded by a railway embankment, to construct which deep pits had been dug, and these, besides being full or overhung by masses of vegetation, connected up into a long stretch of water during the floods. Babool trees and scrubby bushes were also scattered about throughout the compound and between its rear boundary and the main broad-gauge railway line which also ran pretty close. In some places, too, long grass obtained. Lastly, the bungalow was situated on the direct line between the Keoladeo Ghana and large Jhils of like nature at Dig and Kama; hence waterfowl of all kinds and descriptions were continually passing over.

The remaining birds whose nests I actually took in the compound were the Indian Ring-Dove, the Brown-backed Indian Robin, which in true eastern fashion puts the cart before the horse in that it carries its red patch under its tail instead of on the breast, the Crimson-breasted Barbet, with whose monotonous call every dweller in the plains is only too familiar, and the energetic little Purple Sunbird.

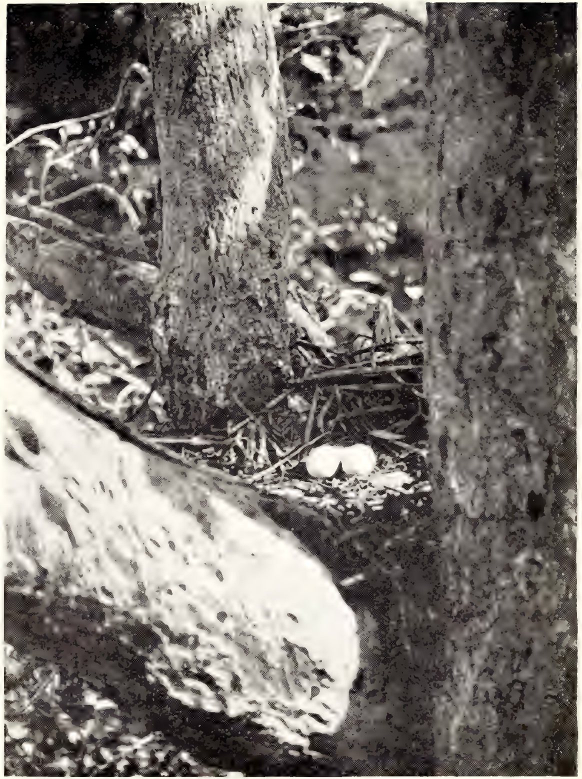
A pair of Indian Ring-Doves (*Streptopelia decaocta decaocta*) started to build their apology of a nest on a rafter in the verandah. I say started advisedly, as at one point I really despaired of its ever-reaching completion. It did however get to the egg stage, though no further. I noticed a most curious fact about this pair of Doves—perhaps only one of them was responsible for the nest construction; I don't know, but hope so. I hate to think they were both equally brainless—and that was that any material which dropped to the floor was never retrieved, and I am sure I'm correct in saying that those fool birds dropped enough twigs, in trying to balance them in impossible places, to build at least four of the nest which was eventually the outcome of their unnecessarily hard labours. This and the Little Brown Dove (*Streptopelia senegalensis cambayensis*) were the two species common to Bharatpur, and they were excessively common too. I don't think I ever saw the Spotted Dove (*S. chinensis suratensis*) there, though it seemed numerous enough a bit further south in Kotah, and seems to be the commonest Dove of all the places of South India in which I have been stationed, as well as of the Hills.

The Indian Crimson-breasted Barbet (*Xantholœma hœmacephala indica*) bores a hole about the size of a half-crown in the trunk or a stoutish branch of any tree up to about a foot in diameter. Near the extremity of a broken branch or of one that has been sawn off and has commenced to decay is perhaps the most favoured spot. It is generally on the under side too, that is if the branch slopes at all. On one or two occasions I have noticed holes on the underside of perfectly horizontal boughs.

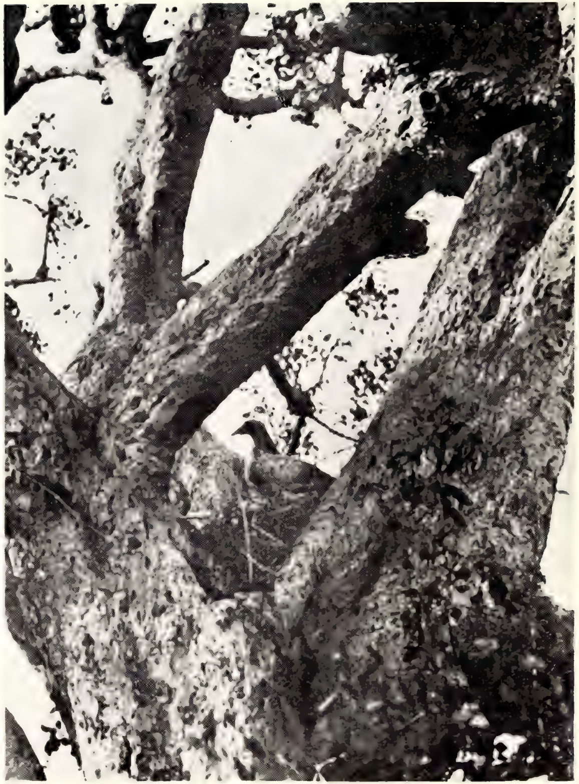
In Secunderabad I watched one of these birds excavating its abode. The spot chosen was only about 10 feet from my bedroom window, so I was able to lie on my bed and watch it at ease. When I first noticed it, the hole was only about half an inch deep, so I could see that the bird worked with the bill slightly open, and that after every few taps it would jerk the chip or chips thus gouged out over its left shoulder. It worked most intermittently, sometimes only for half a minute or so at a time, and often with intervals of some hours in between. Nevertheless, in three days only the latter half of its body remained in sight and it had commenced to turn the cavity downwards. The branch, incidentally, was perfectly healthy and was that of a *nim* tree. The manner in which this quaint little bird arrives at its full-blown 'song' always amuses me. It apparently needs to work itself up to the necessary pitch of excitement and usually starts with a very subdued 'wuk', which steadily increases in volume, at the same time changing slightly in tone, till the rounder and not unpleasant even 'tonk' is attained, and thereafter monotonously reiterated.

The nesting of the Brown-backed Indian Robins (*Saxicoloides fulicata cambaiensis*) has nothing of particular interest about it, excepting perhaps that they have the same habit of choosing strange sites as has the English Robin. One nest I found was in an old *ghurra* which had been thrown into the centre of a bush, and another in a battered kerosine oil-tin lying in a patch of weed. Those I found in my Bharatpur compound were :—two in cavities in the railway embankment, one in the roots of a low prickly bush and a couple more in holes in the back wall of the stables. At the present moment I have a nest full of youngsters a few feet above my head in a pipe intended to drain rainwater from off the roof, but this, of course, is of the Black-backed variety which replaces the Brown-backed Robin in the southern half of India.

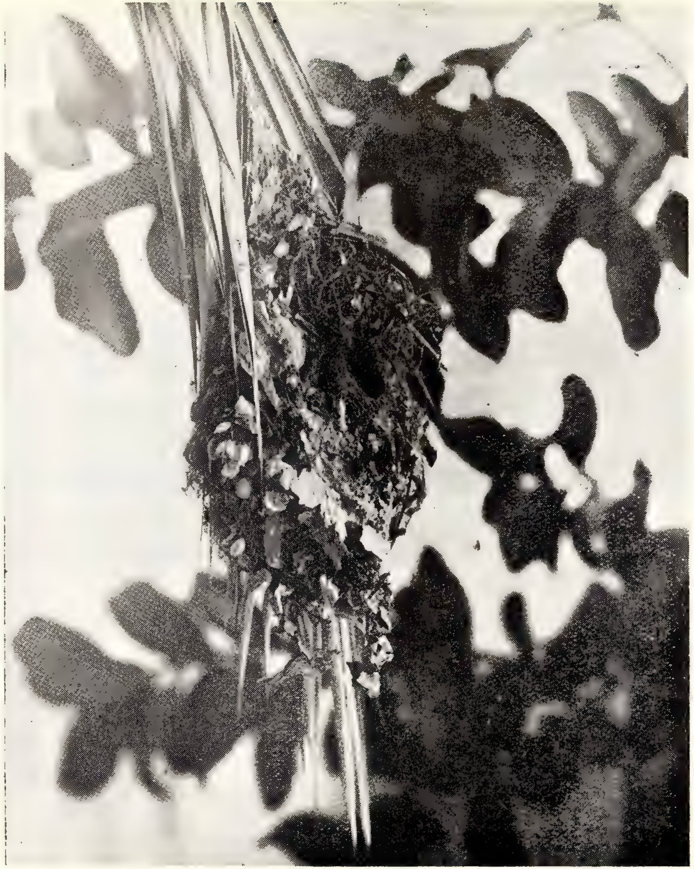
The Indian Purple Sunbird (*Leptocoma asiatica asiatica*) is a highly interesting personage as its nest is such a well thought out structure. It is, of course, known to every dweller in this country on account of its great predilection for flowers and gardens, its unbounded energy, sharp call notes, and habit of ceaselessly flicking the wings, as it turns and twists about the flower stalks in its efforts to extract the honey and insects from the innermost recesses. The male in the breeding season is also possessed of quite a sweet little song. A pair suspended their nest from a rafter in the verandah, but for some reason or other I failed to spot it until the eggs had been laid and the very day following its discovery it was torn down and its remains strewn about the floor, probably by a tree-rat in search of material for its own ball of rubbish stuffed into a corner by a rafter a few feet distant. In Karachi I took a photograph of a nest of this species suspended from the telephone wire close to one of the insulators on the mess wall. Occasionally they are very well concealed, but whether by intent or accident I do not know. Nevertheless it is a most noticeable fact that a large proportion of



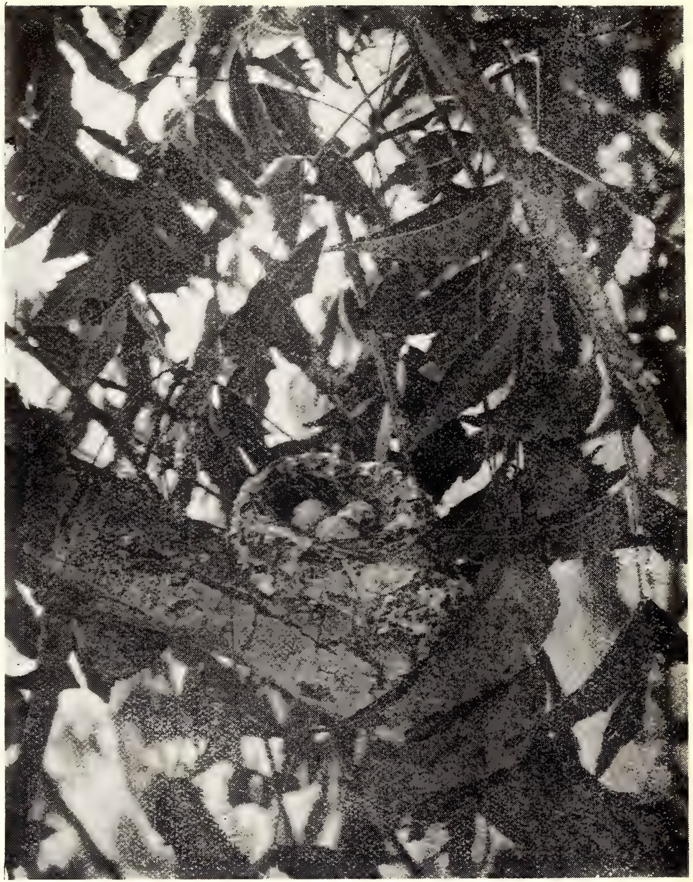
THE DUSKY HORNED OWL
(*Bubo coramandus*)



THE SMALLER WHITE SCAVENGER VULTURE
(*Neophron percnopterus ginginianus*)



THE INDIAN PURPLE SUNBIRD
(*Leptocoma asiatica asiatica*)



THE MALABAR SMALL MINIVET
(*Pericrocotus peregrinus malabaricus*)

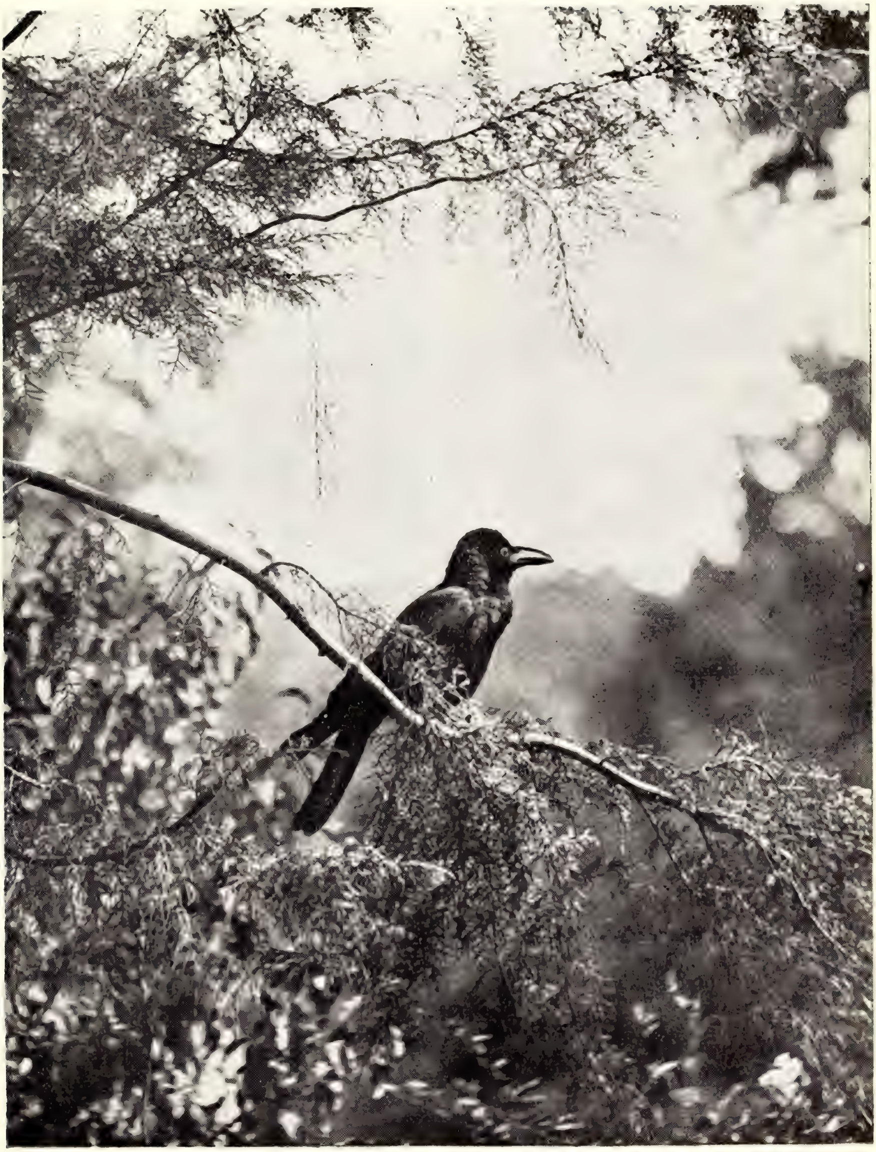
the nests to be found in and around Secunderabad are constructed within large closely woven untidy webs, which abound in the camelthorns. The result is that, failing the presence of the bird, most of them are extraordinarily liable to escape detection. The usual impression conveyed by most descriptions I have read of the nesting of this bird is that a grass nest is first constructed and on to this all manner of decorations in the form of spiders' webs, chips, bark, scraps of paper, etc., are then stuck with an idea of either making it pleasing to the eye or more probably to camouflage it. Incidentally I once remember seeing a nest outside a regimental office door plastered with many scraps of white paper. I don't for a moment wish to assert that this is incorrect. To do so on the strength of observations on a single nest would be absurd, and I have only once witnessed the construction of a nest from its very commencement. However, this was so diametrically opposed to the above conception that it is certainly worthy of notice.

On the 24th of July I was sauntering round the compound of my bungalow on the outskirts of Madras when my attention was suddenly attracted to a Purple Sunbird, a female, which flew down to a very low date-palm and seemed to have become greatly interested in a point a few inches from the extremity of a drooping frond. On looking at the spot, but some 3 feet from the ground as the palm grew at the foot of a bank, I at first noticed nothing at all unusual, but on going closer I discovered a minute piece of web had been wound round the stem with a loose end perhaps half an inch in length left hanging down. Five days later the nest had progressed to the extent of being in shape not unlike the upper half of a crinkled paper-bag suspended from the branch, or a small edition of an unfinished Weaver-bird's nest without the cross bar, but of grass there was no sign. It was but a scant collection of the usual materials found on the outside of these nests. On the 4th of August the outer shell was completed and reminded one of nothing so much as of a deflated penny balloon, the entrance hole appearing like a rent in its side. The next step appeared to be the construction of the porch and by the 8th this and the outer shell were completed even to the ragged little bits which can be seen hanging down in the photograph, but of inner grass nest there was still no sign. In the making of the porch, short lengths of grass had been employed and from this time on grass was the main item brought by the builder. During the next week the balloon was quickly inflated, the bottom even on the afternoon of the 9th presenting a more or less rounded appearance, and, on looking into the nest on the 16th, I found two eggs had been laid. I do not know for certain on what days these eggs were deposited as for three or four days previously I unfortunately omitted to look inside. At any rate, the building undoubtedly took a full three weeks. I find in my diary for the 30th a remark to the effect that the Sunbird's eggs appeared to have been hatched about two days, and later, that they left the nest either on the afternoon of the 15th September or early morning of the 16th, as they were there after lunch on the former date, but had left it when I again visited the nest after breakfast the following day. The whole operation therefore took 54 days, made up approximately as follows:—nest building 22 days, incubation 14, and rearing 18. On the 11th September my bearer brought to me a half-naked young Sunbird of apparently the same species, which he had found lying plumb in the centre of the main road. I suppose it had been dropped by a crow or something, but nevertheless it showed no signs of injury. Taking pity on its sorry plight, I popped it into my Sunbird's nest where it was at once adopted, and, though very much younger than its foster brothers or sisters, it thrived, and was comfortably ensconced in sole possession on the 16th. How long it remained there I do not know, as I did not go near the place again for some days.

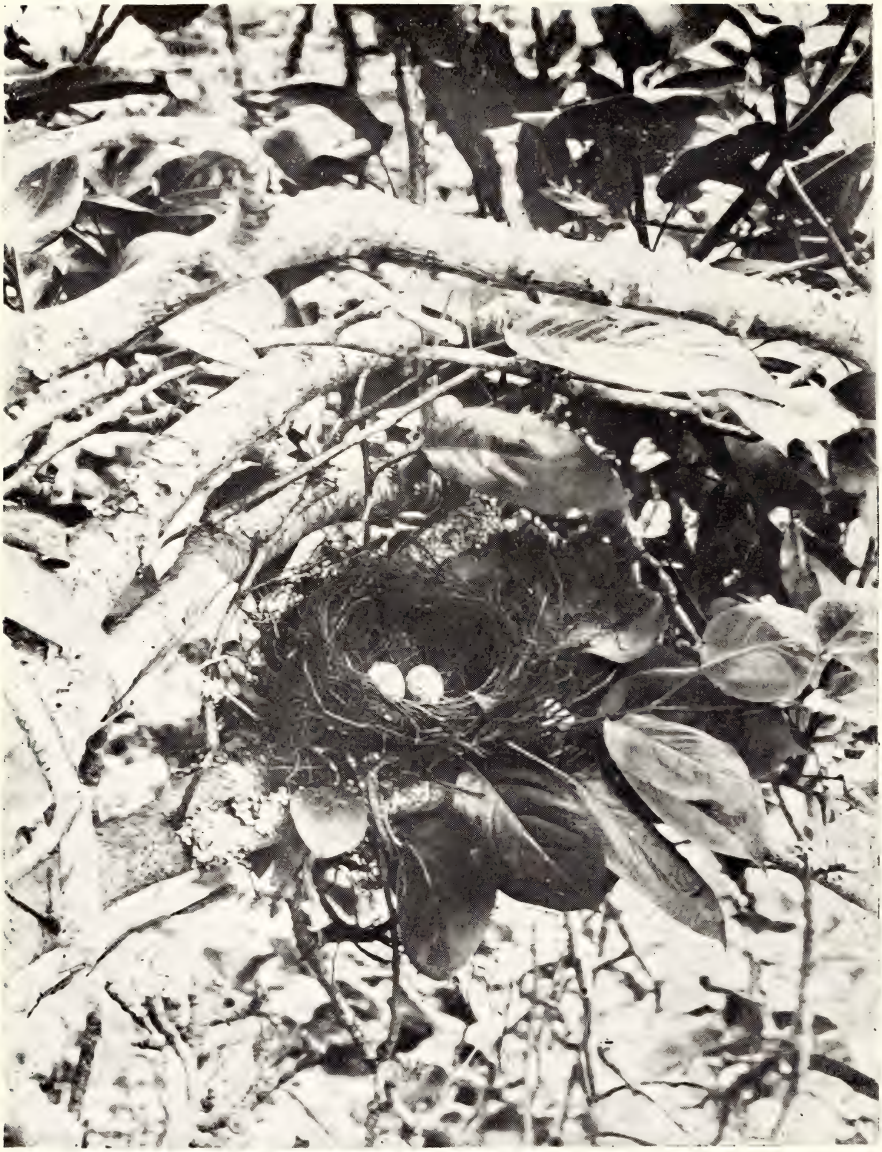
In strong contrast to the tedious nest-building of these Sunbirds were the efforts of a pair of Malabar Small Minivets (*Pericrocotus peregrinus malabaricus*), which started building in the same compound on the 19th of July. So quick were they that by the 29th the full clutch of 3 eggs which the nest then contained showed distinct signs of incubation. The nest was certainly completed by the 25th, as the female was on that morning observed to be seated on it for an unbroken period of at least 3 hours, i.e., from 7 a.m. till I left the house at 10 a.m.

Previous to this the first hours of daylight had been spent in energetic nest-building, both birds flying to and from the site at very short intervals. Operations seemed to get gradually slower as they went on and appeared to cease entirely about 4 p.m. each afternoon. From where I slept on the verandah I could look straight across to the *nim* tree, some 40 or 50 yards distant, on one of the lower and smaller branches of which the nest was constructed at about 12 feet from the ground, and I had therefore ample opportunities of watching their early morning antics at the nest. From below and even from slightly to one side the nest was absolutely invisible, being but a tiny shallow cup of a small quantity of fine grass cemented together with webs and lichen and decorated with bits of dead leaves and bark-scraps, the whole barely the thickness of the nearly horizontal branch on which it rested and with the colouration of which it blended perfectly. To be exact its extreme diameter was just under 2¼ inches, and I should think the whole affair could have been squashed up into a little ball the size of a small walnut, so it is hardly surprising that the Minivets somewhat outclassed the Sunbirds in the matter of speed of house construction.

From amongst the other birds mentioned in the list a few pages back, I took in close proximity to the bungalow the nests of the following:—The Smaller White Scavenger Vulture (*Neophron percnopterus ginginianus*), Nukhta (*Sarcidiornis melanota*) White-browed Fantail Flycatcher (*Rhipidura aureola aureola*), Northern Golden-backed Woodpecker (*Brachypternus aurantius aurantius*), Bay-backed Shrike (*Lanius vittatus*), and Black Drongo (*Dicrurus macrocercus macrocercus*) White-throated Munia (*Uroloncha malabarica*) Baya (*Ploceus philippinus philippinus*) Indian Wren-Warbler (*Prinia inornata inornata*), the Ashy Crowned Finch-Lark (*Pyrrhulauda grisea grisea*) and Indian Pipit (*Anthus richardi rufulus*).



THE SOUTHERN JUNGLE-CROW
(*Corvus coronoides culminatus*)



THE NILGIRI BLACKBIRD
(*Turdus merula simillimus*)

Besides Pharaoh's Chicken, the Common Vultures of Bharatpur were the Indian White-backed Vulture (*Pseudogyps bengalensis*) which outnumbered any of the other species by at least thirty to one, the Black Vulture (*Torgos calvus*), and the Indian Griffon Vulture (*Gyps fulvus fulvescens*). Whenever I shot a Black-buck or Chinkara, after having first removed the head and skin and any portions we required for the larder, I used generally to sit down more or less under cover about 40 or 50 yards away from the carcase just to see what birds and beasts of prey would turn up. The speed with which Vultures made their appearance from almost every quarter of the Heavens was most amazing, though occasionally I have watched near a carcase right in the open for the best part of an hour without any sign from bird or beast to show that the carcase had been spotted although distant specks high up proclaimed that Vultures were on the lookout. Generally the sky would appear altogether untenanted, but within a very few minutes there would be a heaving, hissing and gibbering mass of ungainly birds, fighting one another for places at the revolting feast. They have, of course, more or less parcelled off the upper air amongst themselves, and one bird seeing its next door neighbour, probably a mile or two away, dropping to a dead or dying animal in its own area, at once sets off on a colossal glide towards the spot for which its neighbour is obviously heading. Number 3, perhaps another mile or more farther on, spots No. 2 commencing its volplane and of course follows suit, and this sort of thing is repeated until all the Vultures for many miles around the spot to which the first bird dropped have been apprised of the fact that a meal awaits those who can arrive in time to participate in the torn flesh of the departed. Numbers I fear arrive only to envy their gorged brethren flopping heavily and sleepily around a useless mass of scattered bones, only of use to the slinking cowardly Hyæna, who will not dare to put in an appearance till dusk in spite of the fact that he possesses colossally formidable jaws, which enable him to crush up the largest bones as if they were those of a chicken, and with which he could lay out almost any adversary with which he is likely to meet.

The rush of air through the semi-closed wings of half a dozen Vultures dropping at a steep angle at terrific speed, makes a noise so loud and so strongly resembling that produced by a gust of wind in the tree-tops, that I have been completely taken in by it on more than one occasion, and not until the falling birds have actually come within my line of vision have I realised my mistake.

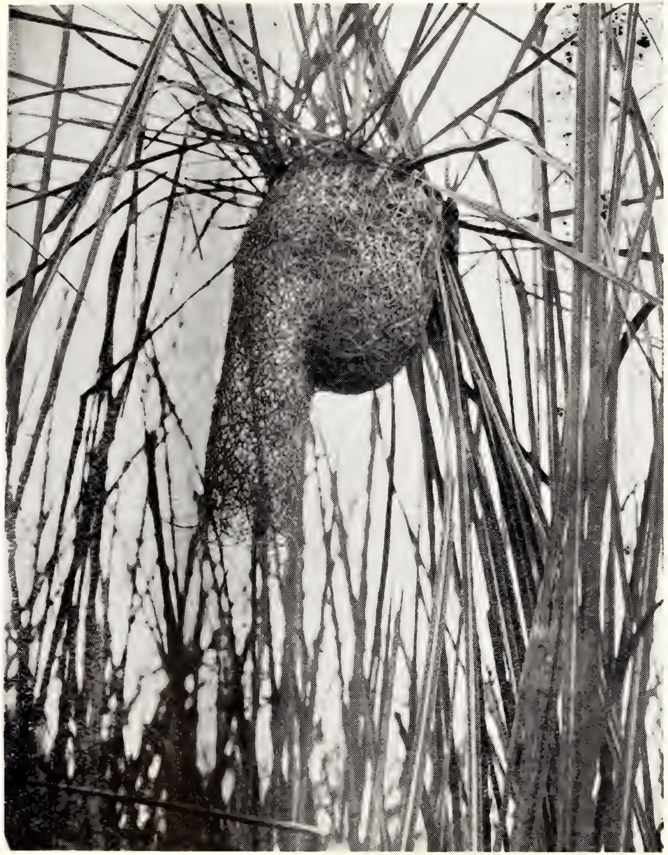
Such greed do these brutes possess, that, in spite of an enormous wing-spread, which enables them to drift literally on motionless pinions from one horizon to the other in practically still air, at the end of their disgusting repast they can hardly raise themselves from the ground, and so lethargic do they then become that one can walk right in amongst them and with a reflex, which I unfortunately did not possess in Bharatpur days, their photography becomes almost too easy to be worth while.

Not alone did Vultures appear on these occasions but crows, kites, an occasional Tawny Eagle and almost always a couple or so of skulking jackals, which, running hither and thither with much snarling and snapping of jaws and with tails for ever between their legs, would endeavour, not invariably with success, to chase off the birds. On one occasion and one I shall never forget, as my rifle was completely out of action owing to the fired case having separated during extraction, a pair of wolves trotted up to within about 40 yards, and then having spotted me seated by a bush about an equal distance on the other side of the kill, calmly sat down on their haunches and derisively watched me feverishly trying to clear the chamber of my weapon. That, incidentally, was the only occasion on which I have ever had a possible chance of getting one of these animals, as in most parts of India they are now somewhat scarce.

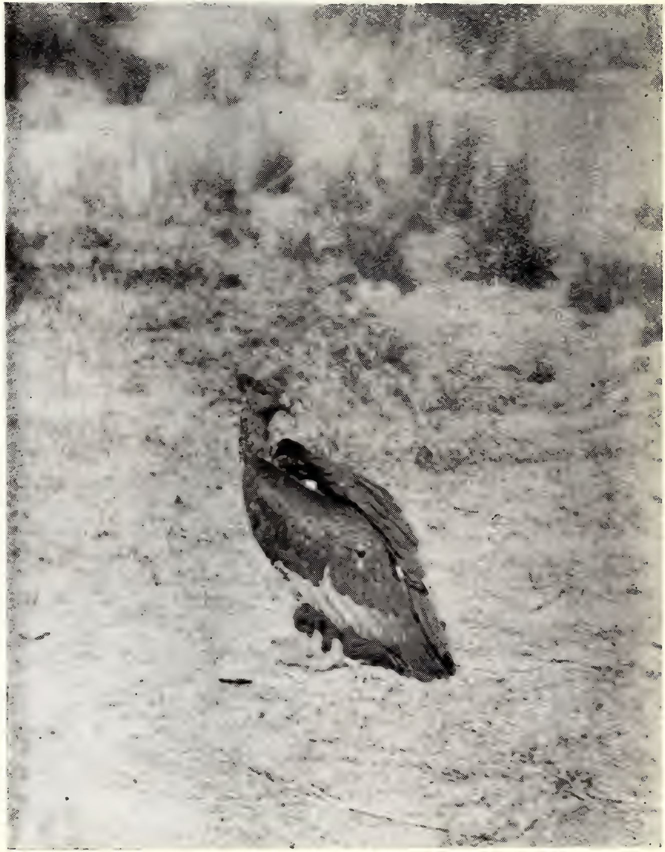
The White-backed Vultures used to breed very freely in the larger pipal trees, one tree frequently having two nests in it and occasionally three. I never once saw a nest that was not difficult of access, so never troubled to investigate any of them. The other true Vultures likewise seemed always to choose situations difficult to reach, and only the filthy Scavenger Vulture was unparticular as to where its abode was placed. The roof of a tumbled down building, the mainfork of a tree but a few feet from the ground or yet a ledge on a church or temple tower, anywhere did for it.

In Secunderabad a short time ago I was watching one of these birds building in the top of a very tall toddy-palm, when an intruder of the same species alighted on the ground near by. The owner of the nest at once took objection to this and set off to chase it from its area, but, as I expected, a fight did not ensue. The two birds merely stood motionless and glared at one another, till at last the intruder thinking discretion to be the better part of valour, made off. All wild things appear to me to be imbued with this instinct which tells them never to fight unless forced to. The reason of course is obvious. A bird or animal injured in any way stands far less chance than its whole brethren in the appalling struggle for existence which takes place in nature, and which is apt to result solely in the survival of the physically fit.

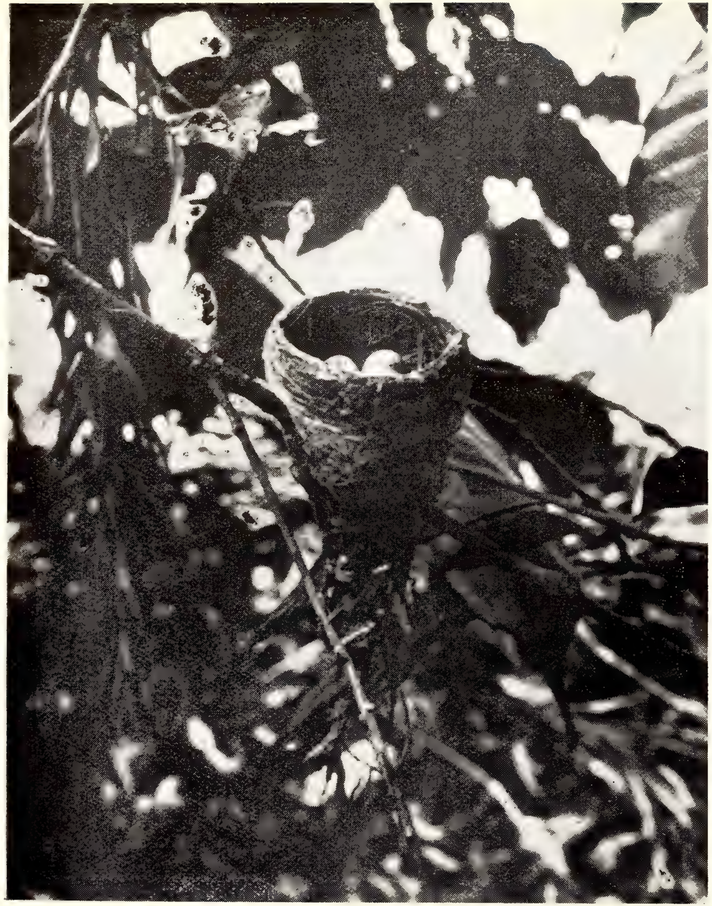
Where a little brute force would, I think, have been of great assistance, was in the absurd farce I saw enacted between a couple of pairs of Common and Black-Headed Mynas (*Acridotheres tristis tristis* and *Temenuchus pagodarum*), which both chose for their nests the same recess between a beam and the verandah roof of my Secunderabad bungalow. I first saw the latter pair at the hole towards the end of April. I was away at the beginning of May and returning on the 11th at once noticed a pair of Common Mynas hanging around. During the next few days they did nothing but pull their weaker cousins' building material out of the hole as fast as it was put in, and after about a week of this appeared to have won the unequal contest and to have started building on their own account. The Black-headed Mynas, however, did not admit defeat, but surreptitiously added material to the Common Mynas' new pile during their absence with the result that the collection of rubbish soon reached colossal proportions. This sort of thing continued till June 4th, when the situation again became critical,



THE BLACK-THROATED WEAVER-BIRD
(*Ploceus bengalensis*)



THE INDIAN WHITE-BACKED VULTURE
(*Pseudogyps bengalensis*)



THE WHITE-SPOTTED FANTAIL FLY-CATCHER
(*Rhipidura pectoralis*)

THE SPOTTED BABBLER
(*Pellorneum ruficeps ruficeps*)

as both birds appeared to wish to make the egg cavity in somewhat different spots. I don't quite remember what happened after this, and the only other note I find I have made is dated June 18th and is to the effect that 'The Common Mynas win'.

I regret I did not do much in the bird-line during my few months in Secunderabad, but amongst other things I took a number of nests of the Dusky Crag-Martin (*Ptynoprogne concolor*) and a couple of the Singing Bushlark (*Mirafra cantillans cantillans*).

A mystery, worthy of solution by the great Sherlock Holmes himself, surrounds the one and only Nukta's nest I have ever found. It was placed in a hollow in the trunk of a fairly large *nim* tree about ten feet from the ground. When the site was originally chosen the tree would be near water, as floods early in July inundated a great part of the State, the main road, within 50 yards of which this tree stood, being under some four feet of water for many days. However when I found this nest on the 25th October, a rather late date by the way, the water had receded and the nearest wet spot was some marshy ground with a few reed-covered stagnant pools roughly quarter of a mile away. On this date the nest contained five eggs and two newly hatched ducklings. And here is where the mystery comes in—one of the chicks was minus its head, which important piece of its anatomy was nowhere to be seen. I am sure it had not been hatched long, and the duck was on the nest and only flew out on my tapping the tree with a stick. I thought this was rather queer and removed the corpse, but next day my mystification was increased still further by finding but three eggs and two dead ducklings, both treated in exactly the same manner. The heads had completely disappeared, apparently having been quite neatly bitten off. The anguished mother was again in evidence and flew two or three times round the tree while I was scratching my head over this extraordinary occurrence. I did not get an opportunity of visiting the nest again for some days, when I found it obviously deserted, smelling foully, and containing two bad eggs and the decaying body of one headless youngster. A civet cat strikes one as being the most likely murderer, but why take away the heads, and would not a civet cat, mongoose or any other animal have laid out all the ducklings and sucked all the eggs straight away, and do mongooses climb trees, by the way? Perhaps the parents had themselves turned cannibal. Surely rats could not have been responsible? One would expect a Nukta to be able to protect its hearth and home against such lesser vermin.

The Indian Spotbill (*Anas pœcilorhyncha pœcilorhyncha*), another resident Indian Duck, I also saw not far from my bungalow in Bharatpur, but I never had the good fortune to find a nest there. In fact, the only eggs of this species I have ever seen were a clutch of eleven, which were collected by an old shikari from a nest in a patch of reeds at the edge of a tank outside Bellary in the Madras Presidency. I was walking round the tank in the hopes of getting a snipe or two and met the old man as he emerged with his spoils. This pair of birds was also breeding somewhat late as the date was the 2nd of November.

The Ashy-Crowned Finch-Lark's nest shown here was actually taken in December, so I hardly know whether one would call it an exceptionally late effort or a very early one, as the breeding season is usually from about February to August or September. Some of the older books I have, call this bird the Black-bellied Finch-Lark, which strikes me as a most appropriate name, as it helps immensely in its identification. The Finch-Larks are close sitters, and I saw an extraordinary case of devotion to duty a couple of months back, in March to be exact. I was putting a number of recruits through a rapid practice on the rifle range, when I noticed a couple of Ashy-Crowned Finch-Larks about twenty yards in front of the firing point. They were gradually working their way closer and closer up in short little runs. The female eventually took up a position on a small stone, perhaps twelve or fifteen yards away, where she remained for the rest of the practice. The male, however, easily distinguished from his consort as she lacks the deep black underparts, continued his advance to a tiny prickly apology for a bush, where he stood for a few moments close to a nest which was plainly discernable now that its position had been given away. Having inspected the contents and after walking round it once or twice, he settled down on the single egg it contained and ceased to take any further interest in the fiendish noise which was going on within some 20 feet of him; even though I could see the muzzle blast perceptibly shaking the little bush at each discharge of the rifles opposite to him. A few days later, when I was again at the same firing point, the egg had been hatched, and this time both birds brought food to the infant on two or three occasions and the female covered it once for about ten to fifteen minutes. This infant, by the way, was clothed in reddy-buff-coloured down which matched to perfection the sandy surroundings. The nest was a very very scant affair of grass, a mere lining to a small cavity scratched out in the bare ground, but more than half the rim was composed of a strip of dirty grey cloth about four inches long. I have also included here a photograph of a nest of the Desert Finch-Lark (*Ammomanes deserti phœnicuroides*) belonging to another genus which inhabits the more barren tracts of the extreme north of India. I took this in Waziristan at Palosina, the scene of some of the hardest fighting during the Mahsud campaign of 1919 and 1920. The chief interest in the photograph, however, lies in the fact that it shows very well the peculiar habit these birds have of incorporating a ring of pebbles in the nest's perimeter, a habit originally acquired, I should think, to prevent the nest becoming silted up by the flying particles of sand blown by the strong winds which so often occur.

Munias and Common Weaver-birds' nests were numerous everywhere, the latter seeming to have a great predilection for babool trees close to wells or overhanging borrow-pits along the two railway lines. Everyone is familiar with the retort-shaped nests of the Baya and the quarrelsome activity of these little finches so soon as the rains start, but perhaps not with those of the Striated Weaver-Bird (*Ploceus manyar peguensis*). The latter's nest shown here was just within the edge of a patch of elephant-grass and quite alone. I noticed it while photographing a colony of Common Weaver-Birds in a babool tree nearby. This Weaver-Bird always makes its nest in the manner shown, bending over the tops of the reeds to form a sort of scaffolding from which to suspend it.

Though a distinctly catching tuneful whistle from the corner of the compound by the railway embankment, close to the Common Babblers' nesting site, continually proclaimed the presence of a pair of White-browed Fantail Fly-Catchers, the beautiful little cone-shaped structure created by this species was not to be found within my garden's limits, and it was not until the breeding season was nearly over that I discovered two nests in the scrub jungle some 200 yards across the railway. One was a used one at the extremity of a branch of a prickly babool tree at about 5 feet from the ground; the other was in process of construction across a twig springing from the lowest branch of a *nim* tree, and about ten or twelve feet up. Unfortunately it was torn down a few days after I found it.

I had an amusing experience with a very close relative of this species in the Nilgiris, i.e., the White-Spotted Fantail Fly-Catcher (*Rhipidura pectoralis*), which is the common variety of the hills of the southern half of India, and which, unfortunately, though it does possess quite a pleasing whistle, lacks the tunefulness of the song of the White-browed Fantail. This species seems as a rule to confine its choice of building site to positions very low down, at times nests being scarcely 18 inches from the ground, though the usual elevation is generally between 3 and 5 feet. Around Kotagiri I have taken many nests in apple and pear trees and also in creeper, a favourite spot in the latter being on a more or less horizontal strand crossing the hollow space formed by the creeper drooping over the sides of a bush. These birds seem to suffer setbacks in their domestic life almost as much as do the Bulbuls. In Kotagiri last year I had three nests under observation at the same time and was merely waiting for the completion of nest-building in the one case and the laying of the complete clutch of three eggs in that of the other two. The first was amongst the lowest branches of a coffee-shrub, and close to the ground; another in a bunch of creeper and the third at the extremity of a thin twig of an apple tree, both the latter at an elevation of perhaps 2½ or 3 feet. These last came to grief after the laying of the second egg. The eggs of the one in the creeper were in all probability sucked by a lizard or a mouse, as all I could find was a small perfectly dry piece of shell directly beneath an undamaged nest. The apple tree nest probably had its eggs bounced out of it by a thieving crow, which I am sure learnt of the nest by the absurd action of the fussy little Fly-Catchers who swooped and swore at every crow or other intruder which alighted anywhere near. The weight of a crow, attempting to pitch on the frail branch supporting the nest, would have been fatal to its contents, and when I came along after witnessing the mobbing of the said crow, beneath the nest were two broken eggs, their contents still soaking into the grass. This pair commenced another edifice a couple of days later in an isolated apple tree some 50 yards from the scene of their recent bereavement, but this had its centre all pulled out just when it looked about complete, incidentally only eight days after their first loss. However, it is the nest in the coffee-shrub which chiefly concerns us here. The coffee patch was but a small one, some 50 yards long and varying from only 10 to about 30 yards wide. So, hearing a pair of these highly energetic Fantails making the unmistakeable fuss, consisting of harsh squeaks interposed with occasional little whistles, which augured the presence of a nest, I went down and hunted through the plantation from end to end, the search resulting in the discovery of three, the first of which was under construction, the other two obviously being earlier efforts. The state of this nest gave one a very fair idea of the method of construction. A rupee placed on top would have more than covered it, nevertheless it was a perfect replica of the finished article and its symmetry was faultless. I imagined it was a finished but abnormally small one, but on both of the two occasions I visited it during the next five days it had grown very perceptibly in size but showed no difference in other respects. On the 10th day I took along with me the half-plate camera and the hide and was relieved to find that two eggs had at last been laid. The place was gloomy, as coffee is always grown in the shade of larger trees, and these bushes were very closely planted with the result that their usual umbrella shape rendered the gloom around the nest doubly intense. On this account it was evident that time exposures would be required. I therefore wished to allay the fears of the nest-owners as much as possible, hence I erected the tent and started to camouflage it with great care. My wife was amusing herself covering the top and sides with her usual success, so I crawled round to the front to tie the flap round the lens of the camera and to complete matters generally. I had to look out what I was doing with my nether appendages, as a kneeling position in front of the tent brought my feet very close to the nest indeed. Having fixed the lens to my satisfaction, I glanced over my shoulder to make certain that the camera was pointing in approximately the correct direction. Imagine my surprise to behold the Fly-Catcher reposing quite calmly on its nest, eyeing without the least concern the soles of my shoes at a range of scarcely a foot. I can hardly see myself reclining at ease directly behind the recumbent form of a dinosaur which is the best analogy I can think of. However, without further delay I got inside the tent, and having waited a little to let her settle down, I loosed off five plates one after the other. I may be quite wrong, incidentally, in saying her, as half-way through the proceedings the two of them changed places, showing that both birds take part in incubation. Unfortunately there were factors I had not taken into account. Time exposures appeared to be out of the question. Firstly, because the bird would not condescend to keep its head still; secondly, because the wind was gently swaying the nest almost continuously. However, by a series of short exposures on each plate I succeeded in attaining my object. But, low be it spoken, I had made the one mistake about which I

THE ASHY WREN-WARBLER
(*Prinia socialis socialis*)

THE CEYLON WREN-WARBLER
(*Prinia inornata jerdoni*)

THE ASHY WREN-WARBLER

have already issued a word of warning. I was too close, with the result that the abnormally large and interesting tail of the sitting bird is out of focus. Of course in this case it was a mistake difficult to avoid, as to get away to a decent distance and yet retain a sufficiently clear view of the nest was almost impossible, especially as I did not wish to damage the coffee in any way.

The only Wren-Warbler I identified in Bharatpur was the Indian Wren-Warbler (*Prinia inornata inornata*) and I took a number of their nests at different times, most of which were of the long purse-shaped variety. In fact, when I come to think of it, I only found one of the small domed nests and this was in a sort of prickly weed on 'Chink Hill' and was only about six inches off the ground. 'Chink Hill', incidentally, being a low elongated feature about one and a half miles behind the bungalow, and so christened as it was a most excellent hunting ground for that beautiful little gazelle, the Chinkara. The photograph here of the Ceylon sub-species (*Prinia inornata jerdoni*) was taken on the summit of the Nilgiris where this bird and the Ashy Wren-Warbler are exceedingly numerous; in fact round the southern and eastern edges of the plateau the latter is, I consider, possibly barring the Southern Indian Stonechat (*Saxicola caprata atrata*) and the Southern Red-Whiskered Bulbul (*Otocompsa emeria fuscicaudata*), perhaps the commonest bird. While on the subject I might make mention of the fact that a bird which a very few years ago was unknown on the top of the Nilgiris can now be reckoned among the common birds, of the edge of the plateau at any rate. This is our old friend the Common Indian House Crow (*Corvus splendens splendens*), which in such places as Coonoor and Kotagiri is now almost as numerous as the Jungle Crow. Another bird, which is not usually counted among the Common Nilgiri birds but which I find very numerous in both the above places, especially so all around Kotagiri and overlooking the Mysore Ditch, is the Ceylon Red-Vented Bulbul (*Molpastes hæmorrhous hæmorrhous*). It is however absent, I believe, from the vicinity of Ootacamund and the Kundahs. Whether the House Crow has penetrated to Ooty I do not know, but if not, I am certain it will not be long before it does so. However I was talking primarily of the Wren-Warblers. The last time I was up in Kotagiri was in April and in this month large numbers of both the above mentioned Warblers were breeding. The majority, however, were in the early stages, and even towards the end of the month, in one patch of tall weeds which I searched pretty thoroughly, out of three nests of the Ashy Wren-Warbler and four of the other, only one of each contained eggs. One of the Ceylon Wren-Warblers' nests was in a wild gooseberry bush and was domed, while those in the straight stemmed weeds were all purse shaped. The Ashy Wren-Warblers' nests were of the type which is constructed by cemented together scraps of grass fibre, vegetable down, etc. The other two types of nest which are described in the new *Fauna* (Second Edition) as being built by this species I also took in the Nilgiris. The loosely-woven grass nests often seem to be constructed in thick weed or grass, and, where the nest is built in a large-leafed plant, the Tailor-bird type of nest is made.

In fact I have always been inclined towards the opinion that there are in reality but two types of nest, these two being the roughly woven affair, somewhat resembling that put together by the Common Wren-Warbler, and what might be termed the scrap nest, but, where these nests are constructed in large leafed plants, the leaves are conveniently incorporated in the structure and at times render a great saving in other materials possible. If the nest happens to be built in a spot where there are even small leaves, those leaves contiguous to the nest will always be found sewn to its sides, making a structure which is, practically speaking, midway between the leaf-nest and the other. In other words they largely depend on what they are built in, and probably mainly differ only on this account. It would be interesting to see if each pair sticks exclusively to one type of nest. Personally I do not think this will be found to be the case. I am of opinion that a bird can and will vary its type of nest to accord with the situation chosen, and will not necessarily stick to one kind of site in order that it may always build the same sort of nest. Unfortunately I have never had a chance of elucidating these points, and all the above is, I fear, mere conjecture.

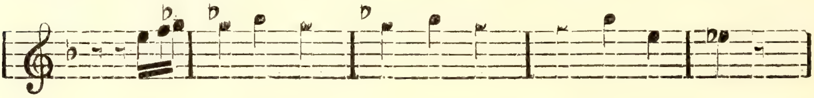
To return to the plate of the Ceylon Wren-Warbler, here this bird evidently disliked the look of the lens, and, though it visited the nest a goodly number of times during the morning, I was only able to get off three exposures on it. It had not really settled down to incubation, the third egg having been deposited only that morning, so it was content with an occasional glimpse of its possessions just to see that all was well, and these glimpses it usually contrived to obtain by working its way up to the nest from directly behind, sneaking through the weeds till it got right up without ever having come out into the full view of the lens. It would then cling to the back of the nest and peer through the thin wall at the eggs within.

Northern Golden-backed Woodpeckers were fairly numerous in Eastern Rajputana and gave one plenty of opportunity for observing their ways, but I find in my all too scanty Bharatpur notes that I made no mention of a habit which I noticed in the Southern race in Madras, namely that they feed almost as much on the ground as they do on trees. Often have I noticed a pair revelling in the treasures of an ant-heap, and occasionally as many as three at once distributed over the surface of the compound, moving about in ungainly hops in company with Mynas or White-headed Babblers (*Turdoides griseus griseus*). Round about Madras they seemed very common indeed, but of course their loud high pitched trilling call at once draws attention to them and probably causes one to imagine them more numerous than in reality they are. In the hills of South India they are replaced by Malherbe's Golden-backed Woodpecker (*Chrysocolaptes guttacristatus delesserti*) which though a bit larger is practically indistinguishable except on close examination, but may easily be recognized in the field by the very feeble imitation of the former's cry. It is also a higher pitched effort and decidedly tinny.

At Mercara in Coorg we were once making our way along the side of a pretty narrow ravine when the rapid tapping of a Woodpecker, probably this species, was wafted up from below, and on looking down the nullah I spotted a lonesome dead tree the best part of half a mile away, the only likely-looking thing in the neighbourhood. The jungle was very thick and from down below the tree was difficult to locate, but once found there remained not the least doubt that this was whence the noise had emanated, for every single branch was so riddled with the holes of both Woodpeckers and Barbets, that it was literally but a tottering mass of pulp, and if it has not yet collapsed I shall be very surprised. In one large branch, which was almost in two owing to the wood having decayed round some adjacent borings, I counted on one side of it alone fifteen holes and on walking round discovered that about an equal number had been drilled into it from the far side too.

This same little valley was also the hunting ground of many Black-headed Babblers (*Rhopocichla atriceps atriceps*), happy little creatures true to the family in their way of going about in bands continually talking to each other in subdued cheeps. I feel almost inclined to accuse these birds of nesting in colonies. Of course I have only met with them in Mercara, so cannot really judge, but there I don't think I ever came across less than two nests together and on two occasions I struck seven within a few yards of one another. Both of these batches were in deep wide ditches practically concealed by undergrowth and creeper and running through coffee plantations. Once in the ditch one could walk down its centre quite comfortably. The nests were loose spheres of coarse grass leaves or bamboo leaves, with occasionally a little moss or other material intermixed, and faced into the middle of the ditch, being anchored as a rule in hanging strands of creeper at about six feet from the ground. They were in a row at an almost even interval of about six or seven yards. The breeding season appeared to me to be over, though I see that they are said to breed from December to August, and this was but the end of April. However, two only of the nests were still being used as sleeping apartments by their respective families, one of which I found to consist of two parents and two children, the normal thing I believe. These ditches were rather secluded, but a love of seclusion for breeding purposes is not one of this bird's traits though shy itself, as I also found nests overhanging paths and close to roads. In nearly every case the nest was constructed in hanging creeper or brambles.

In this valley too were many nests suspended over the pretty little stream which tumbled down its centre. It was here also that I made the discovery that the extraordinary notes, which someone unsuccessfully attempted to make me believe were those of the Malabar Whistling Thrush (*Myiophoneus horsfieldii*), were in fact produced by the Travancore Spotted Babbler (*Pellorneum ruficeps granti*). I consider the Spotted Babblers very interesting birds, but, being of a retiring disposition, they are somewhat difficult of observation. Thick cover with a sufficient carpet of fallen leaves is most to their liking. Hence forest with considerable undergrowth is perhaps their favourite haunt; where they can hop, or perhaps I should say waddle, unobserved, turning over the leaves in their search for insects, occasionally darting in prodigious leaps to catch a bug fleeter than usual. I have seen them in parties of three to five, but more often perhaps in pairs and alone, and, when hunting about the ground, they move with a peculiar somewhat dove-like gait with the body and head close to the ground and the tail bent downwards; a position very much resembling the characteristic poise of the Tree-Creepers. This is their general mode of progression, but, when wishing to move quickly, they are capable of covering a considerable distance in a single hop. They do not confine their activities altogether to the immediate neighbourhood of *terra firma,* but are fairly often to be noticed in low trees and hopping about thick bushes, every now and then leaving off chattering with their neighbours to give vent to their most attractive whistle, a clear far-reaching and very pleasantly toned effort. The song of the Western Spotted Babbler (*Pellorneum ruficeps jonesi*) was lately described in this Journal and is apparently somewhat similar to that which I heard in Coorg. The full lay of the Tranvancore Spotted Babbler, however, struck me as consisting of thirteen notes, and I append here my attempt at recording it in a playable form. Unfortunately it is more than a year since I heard it, and though I memorised it pretty thoroughly at the time, by whistling it after every bird I heard singing, it is quite probable that in the course of the year I have introduced slight variations, which in the aggregate may amount to my version being considerably at fault.



The full song is not always indulged in by the way. The songster often starts off quite merrily and then for no apparent reason suddenly breaks off; it may be towards the end of its effort or almost at its very start. Just like someone who has commenced to whistle the latest popular ditty and in the very centre of a bar has suddenly recalled an immanent appointment with a particularly cruel dentist. Last April I came down the Kotagiri Ghaut from the Nilgiris by rickshaw and when passing through the thick jungle near the bottom, that is, when I was certainly not more than a thousand feet above the plain, I suddenly heard the whistle of a Spotted Babbler quite close. Unfortunately I could not see the minstrel and had not time to stay to listen. Anyhow, the song consisted of the same few notes uttered repeatedly, and, as far as I could make out, was absolutely similar to that recorded for *jonesi.* This I presume would almost certainly be *Pellorneum ruficeps ruficeps* (the Common Spotted Babbler), altogether it produced three bursts for my benefit. In Coorg I was not lucky enough to come across any nests, but at Mahableshwar three years ago I remember finding two nests of the latter species. Though shy birds one of them had very unwisely built its nest in a leaf-filled hollow just within the fringe of trees which encloses one of the tees on the golf links. It soon became known to the caddies, one of whom pointed it out to me. The bird stuck the publicity till the full clutch of three eggs had been laid, but the frequent disturbing of its attempts to incubate soon caused it to desert. The nest was absolutely unconcealed, its back alone resting against the stem of a small and scraggy prickly stalk, which I suppose called itself a bush. Nevertheless the untidy domed nest, surrounded and half-submerged by the dead leaves, of numbers of which it was itself composed, with the dome a fairly bulky but loosely built affair of fresh grasses, was exceedingly difficult to spot, and only the fact of the bird invariably leaving when one was some fifteen or twenty yards off, gave it away; especially as she always flew straight off the nest into the upper foliage of the surrounding trees.

The second nest was also in forest and close to, but not actually in, a patch of thick undergrowth. Like the other one it was amongst a crackling mass of dead leaves, but its back was let into a little depression in a bank at the foot of a tree. On close examination there turned out to be no real foundation to this nest at all. A hollow had apparently been scraped in the leaves and in this a loose hemispherical roof of thin dry seed grass had been constructed, its diameter being about six inches. The entrance was rather large and somewhat untidy, and the three eggs which it contained rested merely on the fallen debris. I put up the hiding tent and settled down within to wait for the birds to appear, but after spending the whole morning in a most cramped position without result, I discovered to my extreme annoyance, on making a closer inspection of the eggs, that they were all bad and the nest obviously a deserted one. The yolks of all three were thickly clotted. In fact it took me some days to thoroughly clean one of them, so it must have been given up some days before. My misspent morning was not altogether wasted, however, as I had spotted through a spy-hole a Northern Indian Stonechat (*Saxicola caprata bicolor*) visiting its mate on a nest in a bank a few yards higher up the slope.

On this occasion I spent the first ten days of May in Mahableshwar, and besides the above my discoveries included many nests of the Southern Red-whiskered Bulbul, a couple of Southern Black Bulbuls' (*Microscelis psaroides ganeesa*), a couple of Indian Pipits', a Ceylon Red-vented Bulbul's, and a Bombay Green Barbet's, a White-Spotted Fantail Fly-Catcher's, and an amazing series of three nests of the Malabar Whistling Thrush. The latter were empty but one and all surprisingly fresh looking and were all clustered together round the face of a small boulder in an almost dry stream, the interval between each nest being at most two feet. I cannot now think why on earth I never photographed them, as, though empty, the photograph would have been of considerable interest. They were, of course, in all probability successive nests built by one pair of birds.

Of the Black Bulbuls' nests, one was in a decidedly unusual position being barely five feet from the ground in a thickish bush close to a forest ride. The other was in a more usual situation, resting, as it was, in a fork at the end of a slender horizontal branch of a small forest tree in a clump at the edge of the race course. Even this was considerably lower than the normal as it was certainly not more than 15 feet up. As the tree did not look as if it could bear much weight, I sent up a small and light chokra to see what was in the nest, and before I could stop him, the young imp had stepped on to the very branch holding the nest. Down it bent to a fearful angle, and fearing it was going to break, he hurriedly relieved it of his weight with the natural result that he gave to us below a very creditable demonstration of the working of the old Roman ballista. Up shot two eggs about four feet into the air, one of them to flatten itself against a branch higher up the other spreading its greasy remains over my hand, as I made a valiant but unsuccessful attempt to retrieve it intact.

The owner of the jerry-built Southern Red-Whiskered Bulbul's nest in the accompanying illustration provided me with considerable entertainment. The nest, as one can see, was built with the usual disregard of durability, concealment and want of forethought displayed by many species of Bulbuls. All the supports being on one side only, the increasing weight of the fast growing youngsters was causing it to heal over to an increasingly perilous angle each day. I was not there to witness the rude awakening of the infants to the realization of the lack of common sense of their revered parents, but I hope the structure withstood the forces acting on it until they were old enough to look after themselves. The bravery of the bird I took to be the female was really most amazing. On my discovery of her treasures she retreated but to a twig within a few inches of the nest and danced there in a perfect fury with beak agape and wings vibrating half-open, swearing and spitting like an infuriated lynx, and when I presumed to put my fingers into the nest and to snap off one or two twigs which were in the way, it really looked as if she were about to attack my hand. Seeing her attitude, I at once rigged up the camera, but the moment the fearsome lens was attached her extraordinary courage evaporated, and not until I had brought the hiding tent into use would she venture to the nest again.

In my wanderings in Mahableshwar through a number of patches of rather stunted and fairly open forest growth I came across a great many old nests of what I suppose must have been the White-Throated Ground Thrush (*Geocichla citrina cyanotis*). They were placed on an average about 5 or 6 feet from the ground in the fork of a tree or fairly open bush, and moss and mud figured largely in their construction. I saw a pretty fair number of these birds about and besides possessing an energetic and very pleasant song, which they proclaim most vigorously in the evenings, they have a peculiar note, if note it can be termed, extremely like the noise of a screeching slate-pencil.

However, let us hark back yet once more to Bharatpur, as I cannot finish this chapter without some reference to the bird noises of the night. Around the bungalow these were many and varied, but the most frequently heard and easily distinguished were the chuckling of the nightjars and the grunting hoots of the

Owls. The Common Indian Nightjar (*Caprimulgus asiaticus*) was excessively common and once, when making my way across a little hollow close to the railway embankment, I found myself on the point of stepping right amongst a bunch of five. One does not often spot a motionless Nightjar, when on the ground at any rate, but it was the black shining eyes of one of the five which just caught my attention. The call of this bird has indeed been very rightly likened to the noise which is produced by a stone skimming over ice.

Chief among the owls were the Dusky Horned Owl (*Bubo coramandus*) and secondly his near relative the Indian Great Horned Owl (*Bubo bubo bengalensis*), at least one pair of which lived at Chink Hill. These birds used to stray as far as my compound and consequently I often heard their grunting calls. The distinctive voice of the Dusky Horned Owl was to be heard from all sides, but chiefly from the grounds of the Moti Jhil, a bungalow just across the railway with a superabundance of large pipal and other leafy trees around it. This bird is very common in Bharatpur and every single grove and garden appeared to have its tenants, as well as the large patches of jungle such as the Chota Ghana and those around the Keoladeo Ghana. During the rains and the cold weather this owl is most noisy and not only at night. In the monsoon months, especially, their voices are often to be heard in the very middle of the day. True, dusk is the time when they are most vociferous and are more generally met with, but in habits they are very diurnal. Nor do they shun mankind, but on the other hand, like the noisy little Spotted Owlets, are commonly to be discovered in groves and gardens in and around villages. The most curiously placed nest of this species, which I have ever come across, was placed in a dead and leafless pipal on a low horizontal branch which barely cleared the roof of a kutcha building in the very centre of one of the largest villages in the State. The nest was large, probably the appropriated nest of a Kite, and was a conspicuous object from all over the village, as was also our friend the owl sitting on it. A number of naked children playing around the base of the tree in no way disturbed her Majesty, nor did she appear in the least put out by the unwonted sight of shining topis and white faces. Another rather curious situation was in the main fork of a very lonesome tree standing in some flooded fields, also close to a village. It was certainly not more than 7 feet from the ground.

This fine bird breeds from the end of the rains onwards to about December, and, besides appropriating the disused nests of other birds, is said to build for itself a fairly large stick affair. The nests, which I suspect to be of the bird's own manufacture, are rather shallow but nevertheless pretty compact and about eighteen inches or so across and are generally placed fairly high up amongst the lesser and leafy branches of large trees, and consequently are fairly well concealed. The appropriated nest on the other hand may apparently be anywhere, so long as it takes the fancy of the bird and appears to be a large and strong enough structure for its nursery.

In 1918 I noticed a White-backed Vulture on its nest half way up, and close to the trunk of, a perfectly tremendous but climbable pipal tree. Wondering if by any chance they ever make use of a nest twice over, I revisited the spot again in December 1919. Over the rim of the nest there peered at me, not the ugly head of a Vulture, but the catlike visage of a Dusky-horned Owl. This is the nest which appears in the accompanying plate, and over the getting of it I thought my last moments had come. Unfortunately I am small of stature but I possessed an orderly of considerable length, and with his aid I managed to triumph over the long stretches between the branches and eventually reached my destination, let down a cord and drew up the camera and its appendages and obtained a number of photographs. But as is so often the case, the descent was very much more difficult than the ascent had been. When I had been unable to reach a branch the orderly had gone up first and then pulled me up, and we ought to have adopted a like method of going down, instead of which he went right down first and I followed. Having lowered myself over a particularly thick branch, at what felt to me some 40 feet from *terra firma,* I suddenly found that my feet were dangling in mid-air, and that I was unable to reach the branch below. That from which I had come was so fat that my hands began to slip, nor was the main trunk any use to me as it was about 4 feet thick. Well to cut matters short I continued to slip inch by inch expecting every moment to feel my toes in contact with the longed-for foothold, but I had no luck and perforce had to drop. No, I am sorry to have to disappoint you and end up so tamely, but my flattened remains were not peeled from off mother earth and carried home on a stretcher. Instead I hit the branch plumb in its centre and did the only decent balancing feat I've ever done in my life. Nevertheless, as below me there was an unbroken drop to the ground, I must admit that on the way home my nerves felt somewhat shattered.

In a previous article I have made mention of the conclusions I have been forced to draw from numerous observations of the attitude of birds towards suspicious sounds where the evidence of sight is lacking, and lately I had occasion to test my theories on the subject somewhat severely. Firstly in the case of a Fly-Catcher which is common to the Nilgiris, and inhabits practically every sholah in the place, no matter how small it may be. This is the Nilgiri Blue Fly-Catcher (*Stoparola albicaudata*). The second case was that of a Ceylon Hoopoe (*Upupa epops ceylonensis*), whose mate I had observed incubating a clutch of five eggs in the base of a stone wall. Both these birds, one must admit, are well used to human beings, the latter especially so, and are likely in consequence to recognize the human voice.

At Kotagiri the Longwood Sholah especially swarms with the former, and immediately on entering the wood their sweet and penetrating song attracts one's attention. Normally they appear to hold cavities in the sides of banks in great esteem as positions for nesting sites. Thus the banks along the inner side of the paths intersecting the sholah are most favourable spots to search and yielded three nests containing eggs, all in convenient positions for photography. April, by the way, is an excellent month in which to look for fresh eggs. The first of these nests had close to it some small roots projecting from the bank-side, and I counted on the bird alighting on one of these before hopping into the nest, which was almost completely out of sight in a pretty deep and hence dark cavity well protected by a number of thin hanging roots. To photograph successfully the bird on the nest would have been impossible without completely removing and altering the whole surroundings, which would also probably have caused desertion. I therefore put up the tent on the opposite side of the path, and focussed the camera on the exposed roots. Fortunately my wife had come out with me and after shutting me up had retired round an adjacent corner to write letters. Within five minutes I heard the Flycatchers singing lustily within a few feet of the rear of the tent and next moment a whir of wings over the top proclaimed the fact that one of them was coming to the nest, and to my extreme annoyance, come to the nest it did, my roots being given a complete go-by, as she—it turned out to be the female—flew without stopping outside straight into the cavity and settled down on the eggs. The male after singing for a little longer close by, flew off, evidently quite satisfied that all was in order. Now what was to be done? If I shooed her off it might make her too frightened to come back again, and even if she did reappear she would in all probability go straight in again. I therefore started talking; first in a subdued voice, and then loudly, until I felt that a sudden shout would not startle her too much. She sat on quite contentedly under this treatment and did not even depart when I yelled as hard as I could to my wife to come to the rescue. I had with me a pretty small watch of the folding travelling variety about 2½ inches square and this my wife laid over the egg cavity and again took her departure. Within a very few minutes the female was back, flying straight in as before. For a moment she stood still on the edge of the nest, then she began to peck at the watch all round, and finally started trying to scratch it off and to force her way underneath it. With such frenzy did she persevere that I became alarmed for the safety of the eggs. After a bit, however, she quietened down and I expected her to fly out and at last make use of the roots as a resting place while she thought matters out. But not a bit of it; instead, she sat down on the top of the watch and remained there until my patience gave out. A fact worthy of record, by the way, and one which provides much food for thought, is that the whole time she was frenziedly scratching away she was singing as hard as she could. Again I had to appeal to my wife and this time the whole cavity was stuffed with bracken, but this too turned out no good, as the mother hovered about outside it like a humming bird, eventually worming her way into a bit of a hole in the bracken and sitting only half in sight of the lens. A third time I was obliged to call to my long-suffering memsaheb, and success was at last achieved by pushing in a little stick just by the side of the bracken, and on this the female had the decency to alight repeatedly with the result that a number of plates were soon exposed. After the fifth exposure, however, I inadvertantly bumped the camera while she was on the perch, causing the lens to shift a trifle. Immediately away she flew and it was some twenty minutes before she dared return. Noise she could put up with, but the moment something moved as well, suspicion of the hide invaded her. Unfortunately Longwood Sholah is a pretty gloomy place at any time, and the negatives obtained on this occasion were all under-exposed. A few days later I tried my luck on one of the other nests and, profiting by the experience gained in the above episode, I blocked up the entrance to the nest before ensconcing myself within the hide. To provide a perch was unnecessary, I am glad to say, as I do not like introducing anything extraneous into the picture, but always endeavour to depict both birds and their nests as they are naturally. This time I had no difficulty except with the light, as, although I gave as long exposures as the bird would permit, these negatives too show distinct signs of underexposure, mainly traceable to the fact that my ultra-rapid plates had come to an end and I had had to revert to ones of slower speed. I also tried to photograph a Rufous-bellied Short-wing (*Brachypteryx major major*) in this same wood, but once more the gloom proved too much for me. Hence illustrations of the nest and eggs of this bird and of those of the Black and Orange Fly-Catcher (*Ochromela nigrorufa*) and the Indian White-Eye (*Zosterops palpebrosa palpebrosa*), two more denizens of these Nilgiri Sholahs, are all I can run to.

The Hoopoe episode was as follows:—The strong-smelling scattered collection of rubbish which they presumed to call a nest was, as I have said, in a stone wall some fifty yards above a road. After I had used up four plates on the male bird who was engaged in bringing food to its mate, whom I discovered was not only sitting on eggs but also on two newly hatched babies, my wife called up to me that she was going home as she was unable to discover a shady spot in which to sit. Although at that moment the female was within and the male actually on the ground but a few feet from the tent, I shouted down to my wife telling her what my intentions were so soon as I had finished with the Hoopoes, and the illustration here was actually taken in the midst of the conversation, as our friend took not the slightest notice of my voice but paddled up as usual to the nest-hole, inviting his spouse the while to come and take the fat grub he held for her in the tip of his bill. The male Hoopoe is a good husband, and certainly works hard for his living, as his lady seldom leaves the nest once she has started laying, until the young have been hatched some time. As this one came flying to the nest he always uttered a series of not unsnipe-like 'penches', and when at the hole invariably talked to his wife in a subdued rapidly-repeated sort of coo.

The Hoopoe is, of course, far from being a man-fearing creature, but even so I am perfectly certain that no Hoopoe would enter its nest with a man sitting but 5 or 6 feet away, without, at any rate, an enormous amount of tuition first. I am all the more convinced, therefore, that as a general rule birds cannot and will not believe that real danger is to be apprehended when they can only hear, but cannot see, anything of which to be afraid. They seem, in fact, to lack all powers of deduction. A few of the smaller birds, and with a decrease in size a corresponding increase in foolhardiness appears to be the rule, can be got with but little expenditure of patience used to the idea of coming to the nest with one close by. In my school-days I remember being busy photographing the abode of a Spotted Fly-Catcher. The pair concerned had nested in the ivy on the wall near my study window for some years and were quite at home with the genus school-boy. While I was focussing with my head under the cloth, one of the birds landed on the top of the camera and flew thence straight on to the nest, where it sat quite unperturbed during the remaining operations.

The photograph of the Southern Grey Tit (*Parus major mahrattarum*) here depicted was taken about 30 yards from a garage in front of which a car was being washed, but here too I made use of the hiding tent though without troubling greatly about its concealment, as even a cheeky little Tit is apt to differentiate between 5 or 6 and 100 feet, though, why—goodness only knows, as it is just as easy for it to be spotted entering its nest at the longer distance as it is at the shorter.

Laughing Thrushes are as a rule put down as shy customers. Yet one of the only two cases I know of, where a bird has really not seemed to mind a tinker's curse about my presence was in that of a Nilgiri Laughing Thrush (*Trochalopterum cachinans cachinans*). This bird was only building, yet it came to the nest while I was erecting the tent late in the evening with the intention of photographing it the following morning, my idea being that it would be advisable to give the birds a chance of getting used to the hide during the night as otherwise they might fear the structure and refuse to come near for hours of valuable daylight, as birds often do not appear greatly attached to their homes until after the eggs have been deposited. As, however, it was then too late for photography, I went on with the erection of the hide, while the bird remained on its half-finished collection of moss, although I was working in full view and within 8 or 9 feet of it most of the time.

The next morning there were no signs of either of the birds until I had been in the tent for upwards of half an hour. Then, however, one of them arrived, incidentally without any fresh material, sat in the still untidy nest and commenced to shape the egg cavity with its breast, by turning round and round as it sat. It was in the midst of this process when I took the photograph opposite. After a time it suddenly gave forth a few piercing yells in answer to its mate, and then settled down for a bit of a snooze. Perhaps to talk of this bird's call as a 'Crow' rather than a 'Yell' would be the more accurate, as, in order to produce the noise it raised its head high in the air, puffed out its chest and opened wide its bill, assuming thereby a very cock-like stance. Unfortunately I was unable to photograph it in this attitude, as it was in such a position that one of the supporting branches of the nest was directly between it and the lens. After I had taken a number of photos, I pulled aside the front flap of the tent, and lo and behold the bird still sat on, and it was only when I emerged completely that it took it into its head to quit. It is, of course, altogether fallacious to conclude that because one bird is fearless, any other of the same species will be equally so. This is emphatically not the case, and I had sat in front of another Nilgiri Laughing Thrush's nest but a few days previously for a couple of hours before the female, who had been sitting for some days on two eggs, picked up enough courage to return, and I am convinced that she would not have faced the camera at all, had it not been for the advent of a heavy rain-storm. She obviously objected to her treasures getting wet. The resultant photos of this bird are in consequence somewhat peculiar, as the light is strongly reflected from the many rain-drops which cover her back and tail.

The hiding tent, to which I have at times been alluding, is not the one which I mentioned as ordered from Cawnpore, as the makers thereof evidently considered that they knew more about my requirements than I did myself, and sent a thing altogether unsuited to the work in hand. I therefore drew up the plans for another in Secunderabad, whither I was transferred early in 1922, and having enlisted the services of a local *durzi* and later of a carpenter, we evolved between us the contraption which has since proved so useful and quite up to everything so far required of it. It is made of good quality khaki drill, double along all seams and edges, and consists of a centre piece 3 ft. by 2½ ft., which forms the roof, on to which are stitched end pieces 3½ ft. deep which widen to 4 ft. along their bottom edge, and two side pieces 3 ft. long at the top to fit the roof and 3½ ft. deep to correspond with the ends. These widen to 5 ft. along the bottom edge. When spread out flat the tent therefore looks something like a Maltese cross. The reason why I made the walls in the above manner is that it allows one a certain amount of latitude in the ultimate shape of the erected tent. Along each of the sides of these four flaps or walls are four eyelets so that all or any pair of the edges may be laced up as required. Horizontally on the outer surface of each flap are stretched three khaki ropes caught at intervals to the drill so that loops are formed, and across the top ropes are likewise sewn. Into these loops, grass, branches, ferns, etc., can very quickly be rammed; thus the tent takes but a short time to camouflage. The frame to hold this up is of wood, and consists of but four separate pieces as follows; two plain end-pieces, in length the width of the roof, and two side-pieces corresponding in length to the roof, and on which the four legs are hinged in such a manner that when folded each pair lies close together and along its respective side-piece. Unfolded they are kept in position by hooks, the sort of thing one uses to keep windows and shutters open in this country, and also by four 5-inch pins which are inserted in turn through eyelets in the four corners of the drill roof, then through corresponding holes in the wooden side-pieces and end-pieces of the frame and finally down the centre of the legs themselves. These pins therefore not only help to fix the legs, but also clamp the separate pieces of the frame together, and keep the roof tight and in position.

It will be seen, therefore, that the whole affair can be erected in a few moments. This frame is made of teak but any other strong wood will of course do, as teak is certainly rather heavy. Still the complete tent only weighs 15 lbs., and rolls up into a cylindrical bundle some 3 ft. long and about 7 in. thick. It could probably be made to weigh less as both the side and end-pieces are considerably stouter than is absolutely necessary, being 1¾ in. wide and 1 in. thick. I prefer to have it really strong, however, as one does not want to risk breakage at a critical moment, and often, owing to the slope or unevenness of the ground, considerable strain is imposed upon it. For spy-holes one can either squint through the corners or else cut slits where required in the drill. After a few tears have been made, one will find that the practice of apparently ruining the tent may be stopped, as only a limited number are required in any one wall. For the lens, slits are likewise cut, just big enough to stretch over the lens seating, over which is pushed a rubber ring to prevent the flap slipping back and covering the lens up again.

When at work in the tent, it will be seen that one is seated in an oblong box 3 ft. high, 3 ft. long and 2½ ft. wide. This may not appear altogether palatial, but it is ample for me with a half-plate camera, a 5 by 4 reflex and their necessary impedimenta and since starting to use it, I have never had occasion to endure the agonies one reads of through sitting in a cramped position for hours on end, for the simple reason that I have found movement quite easy in this amount of space. The middle of the last sentence is rather suggestive of an advertisement for a quack medicine. However, to continue; the only improvements I can think of at present are that the legs might be lengthened by about 6 inches. However the actual details of size rest with the person who is to use the tent, and he will of course adapt it to his own bulk. Another possible improvement is that it might be made sunproof. Now, it certainly is not, and one has often to endure a topi in consequence, and as topis are bulky this is a nuisance, since one is liable with such an ungainly thing on one's head to bump it into the sides or roof of the tent, and so upset the equilibrium of the bird one is attempting to photograph.

As I have described the hide, it would not be out of place to describe the cameras I use in it. Undoubtedly where one's means limit one to a single camera, a half-plate field camera is indispensible. For all round general work both in and out of the hide this type and size is without doubt the best, and is what I think most bird-photographers use. My half-plate is an Ensign Triple Victo with a battery of Zeiss and Ross lenses of different focal lengths, which I have picked up at odd times and which give me a choice of varying the size of the picture without necessarily having to find a new position for the camera, an undertaking which is often impossible or nearly so in a restricted place or in trees. The lenses in question are a 4 inch Ross wide-angle, a Ross-Zeiss convertible anastigmat with focal lengths of 7¼ inches for the combination and 11½ inches and 14 inches for the separate components, and also a Zeiss Protar giving focal lengths of 17 and 29 centimetres. I have in addition a Zeiss telephoto attachment for use with the Protar, but so far it has proved itself quite an unnecessary possession. Still, if it comes in useful even once, I shall consider it has justified its existence. Actually only one good anastigmatic lens, preferably of the convertible type, is necessary, though to possess two is more convenient, namely one of long focus for use in the hide, as this enables one to get a decent sized image without having to work uncomfortably close up; and the other of fairly short focus say 6 inches or 7 inches at the outside, for photographing nests and eggs, etc. The long focus lens should work at a very large aperture, so that short exposures may, where necessary, be given in a bad light. Only lately I expended 14 plates on a bird standing near its nest in a mud bank in a pretty thick forest, yet with a lens working at *f* 5.4 and using exposures of one-third second, one and all were underexposed, even though the sun was shining brightly directly overhead, and within a few feet of the nest was a large glaring patch of sunlight. A couple of attempts at short time exposures of about one second were even on the underexposed side, and these latter negatives were of no use as the image of the bird was in both cases blurred through movement. The ordinary photographer, used to taking landscapes, etc., will be surprised at the comparatively long exposures required to avoid underexposure in the photography of birds and their nests. Hence the necessity for the lens with a very wide stop.

With a bird seated on its nest the stop and exposure problem is not so acute, as many sitting birds remain pretty still, and I have at times used exposures of the best part of a minute. A Nilgiri Quaker Babbler (*Alcippe poioicephala poioicephala*) obligingly sat still for such a period, when I was once obliged to stop down the lens, a Ross telecentric, as far as it would go to get the necessary depth of focus, as the only possible position for camera and tent was so close that the limited extension of the reflex I was using was insufficient to bring even the furthest portion of the bird into sharp focus. However, by slightly unscrewing the front combination of the lens and stopping down as I have said, I succeeded in getting a quite passable negative. The nest was in a particularly dense patch of forest, and as it turned out, double this exposure would have produced a better result. Very often the click of the shutter has the most convenient effect of making the bird sit as still as a rock, while it listens with strained attention for further repetitions of the unknown sound. I have found this to be particularly the case with the Thrushes. Everyone knows the look of annoyance and the outraged demeanour assumed by the common Song Thrush at home when one presumes to approach it when seated on its nest. However, I have found that even with a nervous bird, which is continuously shifting its head or which jumps up seemingly the moment one presses the release, exposures of up to about half a second don't so very often show movement, the bird apparently not being able to get on the move, after being startled by the opening of the shutter, until after the exposure is finished. Of course one needs to judge the correct moment to take the photograph so as to get the bird during a period of stillness, and this is largely a matter of practice.

Another necessary adjunct in the lens is a surplus of covering power, and sharpness to the very edges of the surface it does cover, that is to say that in a half-plate camera, a lens which covers a whole plate without showing any loss of definition round the edges should at least be used. Especially does this necessity arise in taking photographs to show off the contents of nests, as with the ordinary tripod the camera cannot usually be depressed as a whole at a sufficiently deep angle, and the lens has therefore to be still further tilted, with the result that its axis no longer passes through the centre of the plate. To tilt the nest instead of the camera is very bad policy indeed and only results in an unnatural-looking photograph. Besides, one wants one's reproductions to show the subject exactly as it was constructed and used by the owners. Most field cameras have a tilting back but unfortunately not all of them tilt backwards sufficiently far, that is, well beyond an angle of 90° with the camera base. However, this defect can very easily be remedied as a rule by removing the locking devices and rescrewing them on to the camera body a little lower down. To be able to swing the back of the camera in this manner comes in especially in photographing nests on open patches of ground, such as beds of shingle or on the sea-shore, open commons, in heather, etc., in fact anywhere where it is an advantage to get the foreground and distance both in focus in order to give one a fuller impression of the bird's habitat without having to stop down greatly and so unnecessarily increase the exposure. The near foreground of the picture to be in focus requires a longer extension than does the distance, and as the image cast on the plate by the lens is, of course, inverted, this state of affairs is consequently arrived at when the back is tilted beyond the vertical, as the top of the plate is then further from the lens than is the bottom of it.

Lately I have been using a 5 by 4 reflex in the hide with most excellent results, but, before I go any further, let me say that though a great convenience a reflex is not an absolute necessity, whereas a field camera, and preferably a half-plate one, most certainly is. The reflex does, however, save one from making the mistake of photographing the bird when it is out of focus, and also of course one has a chance of putting a bird rapidly in focus and getting its photo, where the time wasted and the noise made with an ordinary camera in removing the plate, refocussing and replacing the plate, renders such a course out of the question, and all one can do is to wait for it to condescend to alight on the exact spot on which one has previously focussed. The lens I am using in this reflex is an 11 inch Ross Telecentric working at *f.* 5.4 and the main reason why I invested in the 5 by 4 size is that it naturally racks out further than does a quarter plate of the same make.

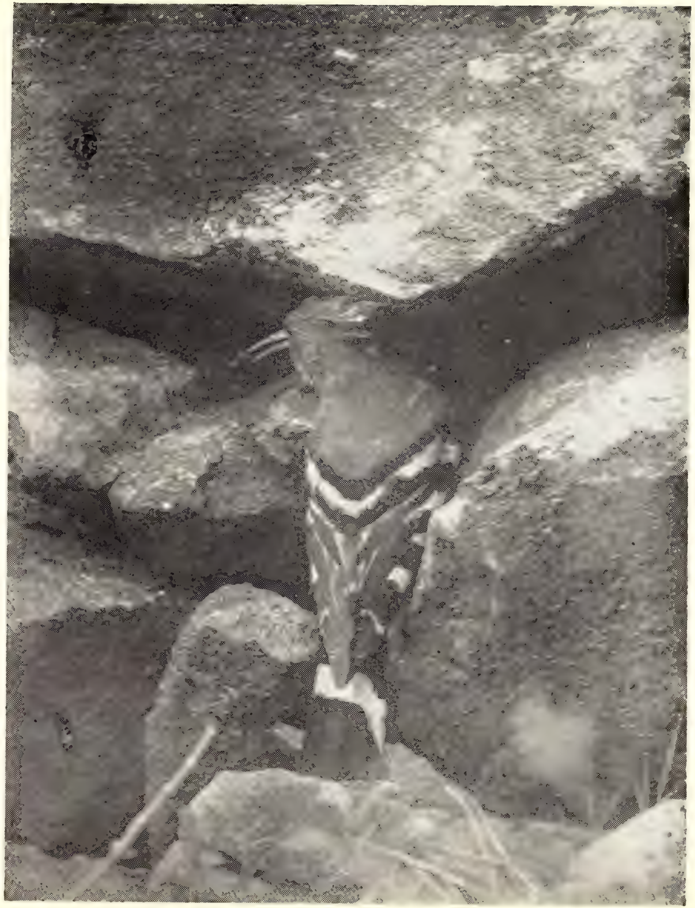
The obvious course when buying a reflex is to choose one with a long extension, but I bought mine in India when reflexes were both hard to get and infernally expensive, so took the first I could get. There are now many good cameras of this type on the market, and some of them are probably more suitable for bird-work than mine, which incidentally is an Auto-Graflex, with the performances of which, however, I am perfectly satisfied, and I see from the current Kodak list that there are many improvements in their present Graflex cameras, which put mine clean out of date. The low-powered telephoto lenses seem also to have been much improved of late.

When using the reflex in the hide, I always remove the focussing hood for convenience, as the restricted height of the tent makes it very awkward to work with it on, and the tent itself is quite dark enough to render the image on the screen easily visible. It is quite safe to do this, and even when using the mirror as the shutter with the focal plane shutter open, I have never had a plate spoiled by extraneous light entering through the screen and passing round the edges of the mirror. Using the mirror in this way gives one a pretty silent and comparatively long instantaneous exposure, probably of about half or one-third of a second. If the shutter is put out of action and at open, and one regulates the raising and lowering of the mirror with the right hand, while holding down the release with the left, one obtains a means of giving an absolutely silent time-exposure of any duration and this is of considerable use at times when working on a sitting bird, which shows signs of sleepiness or is naturally still.

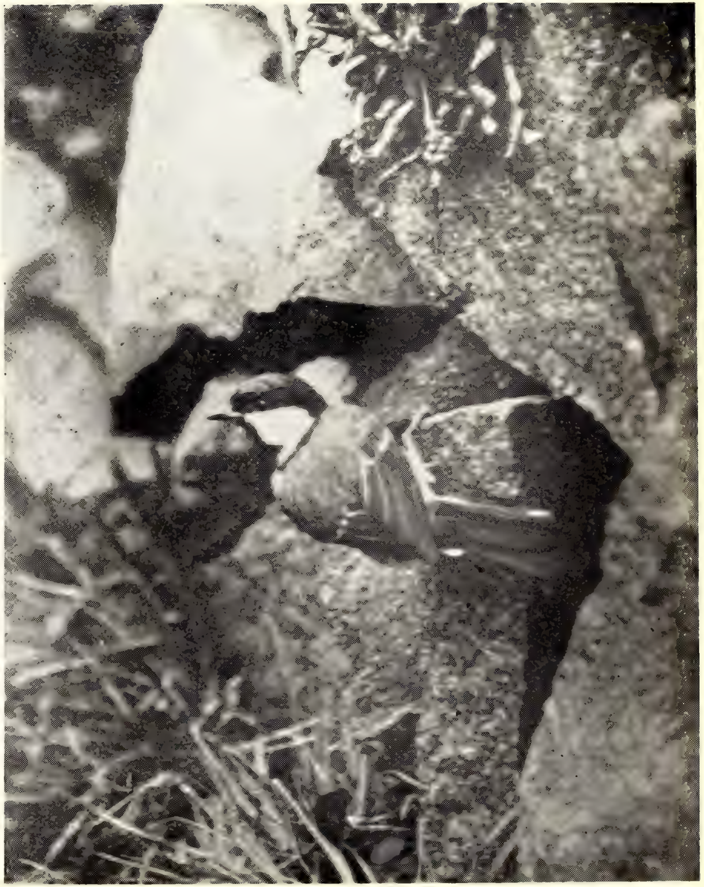
When taking small birds, I invariably use quarter plates in wooden carriers in the plate holders of both these cameras, since, as the image is small and generally only a comparatively small area is required from which the finished enlargement will be made, it is only a needless expense to use the larger plate. I have already mentioned why it is better to get a small image all of which will be in focus, so it is unnecessary to go further into that point.

As regards the best plates for use in bird-photography I will not say much, as most photographers have their own particular fads about them, but I must say the ordinary special rapid type by any of the well known makers take a lot of beating in this country. Of course orthocromatic plates give a better impression of the true grading of the colours of the subject. Recently I have taken to the Ilford Iso-Zenith plate wherever I have anticipated the necessity of high speed, and have found it most excellent. Its H & D speed number is 700, so one can naturally cut down exposure considerably. The Hoopoe photo was taken at 1/40 second at *f*. 8 on one of these plates, when the sun was not shining directly either on the bird or its immediate surroundings. The Southern Grey Tit is also an effort on one of these plates and was taken at 1/20 at *f*. 8 on quite a dull day. The only rub is that they do not keep for very long, and once the tin in which they are sealed has been opened, it is advisable to use them up pretty quickly.

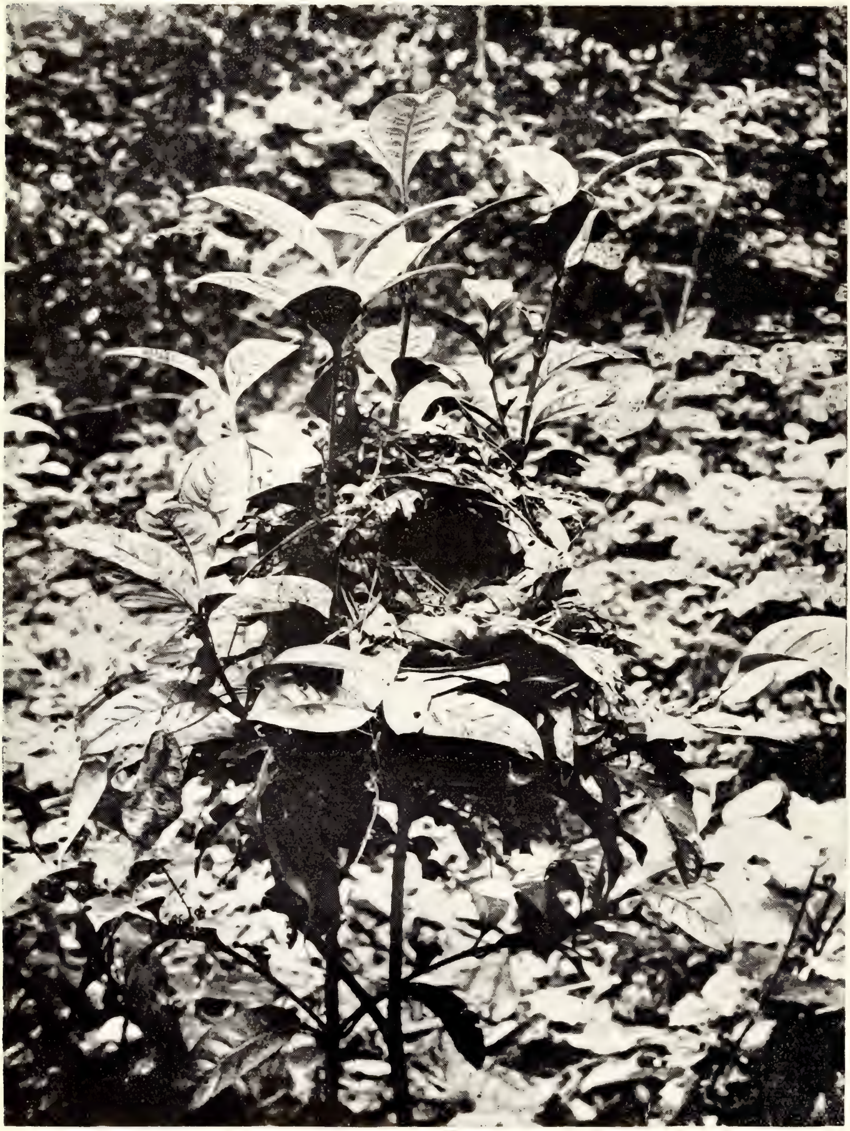
An enlarger, by the way, is a most useful possession, and one which I consider the bird-photographer cannot well do without. I for one, know that many of my earlier photographs would be infinitely better enlarged than they are at normal size, but one is very chary of sending hard earned negatives through the post,



THE CEYLON HOOPOE
(*Upupa epops ceylonensis*)



THE SOUTHERN GREY-TIT
(*Parus major mahrattarum*)



THE BLACK AND ORANGE FLY-CATCHER
(*Ochromela nigrorufa*)

especially the Indian one, let alone the feeling one has that other people do not always treat one's negatives with the care with which one would like them to be treated. It is somewhat annoying, to say the least of it, for a negative to come back with a large scratch right across it, far more annoying in fact than if one had smashed it altogether oneself. To do one's own enlarging will eventually turn out an economy, too, and the initial expense need not be great. The half-plate camera, with the lens with which the negatives were originally taken, again comes in, and can be used with daylight as the illuminant by having a hole cut in the dark-room window or door with a reflector behind it. Over the hole the camera is closely fitted so that no light can enter the room other than that which passes through the negative and lens, and the bromide paper on which the enlargement is to be made is pinned on to an easel placed in front of the lens on a table or other convenient support.

(*The End*)

ON A COLLECTION OF MOTHS OF THE FAMILY *GEOMETRIDÆ* FROM UPPER BURMA MADE BY CAPTAIN A. E. SWANN

BY

LOUIS B. PROUT, F.E.S.

PART II

(*With a plate.*)

(*Continued from page 146 of this Volume*)

*71. *Perizoma schistacea* (Moore)

Anticlea schistacea Moore, Lep. Coll. Atk., p. 273 (1888) (Darjiling).

Htawgaw, April-May, 1923, 1 ♂; Hpimaw Fort, June 1923, 3 ♂♂, 1 ♀.

A small and rather aberrant form, perhaps worthy of a name. Typical *schistacea* belongs almost exclusively to Sikkim and Assam, though it has also been recorded from Dalhousie.

*72. *Perizoma cerva* (Hmpsn.)

Cidaria cerva Hmpsn., Journ. Bombay Nat. His. Soc., xiv, 515 (1902) (Sikkim).

Htawgaw, September-October 1923, 1 ♀.

Only two specimens hitherto known to me, the second being a ♂ ex Coll. Elwes, presumably also from Sikkim, labelled by him ' unnamed in Coll. Atkinson '.

*73. *Perizoma lacernigera* (Butl.)

Idaea lacernigera Butl., Ill. Het., vii, 109, Pl. cxxxvi, Fig. 15 (1889) (Dharmsala).

Htawgaw, April-May 1923, 1 ♂; 1 ♀; Hpimaw Fort, June 1923, 1 ♂.

Also known from Sikkim.

*74. *Perizoma hockingii* (Butl.)

Eupithecia hockingii Butl., Ill. Het., vii, 115, Pl. cxxxvii, Fig. 12 (1889) (Dharmsala).

Htawgaw, April-May 1923, 1 ♀, September-October 1923, 1 ♀.

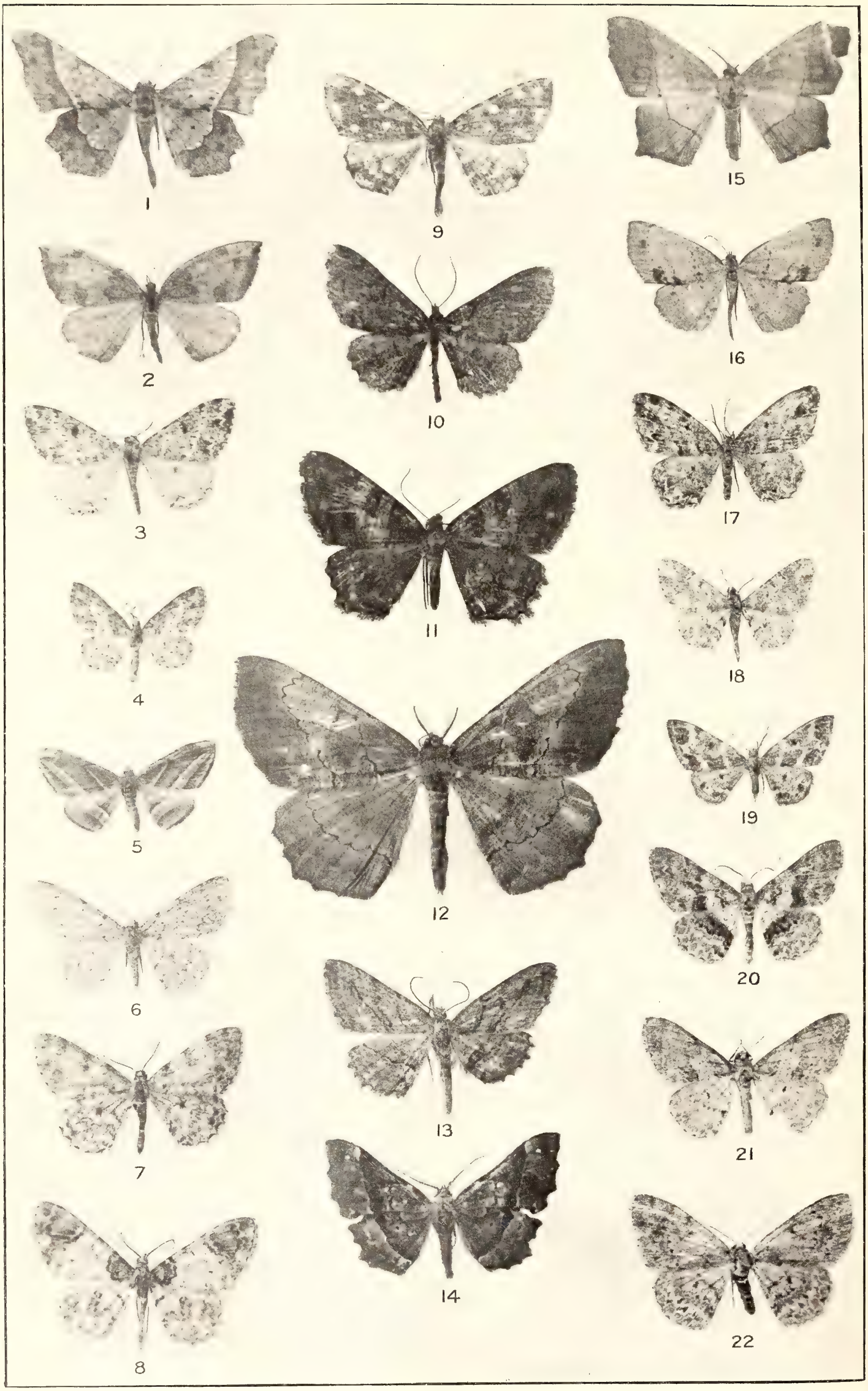
Both this and *lacernigera* may prove racially differentiable from the North-west Indian forms, but Sikkim examples of both seem fairly typical.

*75. *Perizoma puerilis* sp. n.

Perizoma puerilis Warr. MS. in Coll. Tring Mus.

♂, 20 mm. Face whitish (partly abraded). Palpus longish, 2nd joint with rather long loose scaling directed forward, 3rd joint moderate; pale, with some blackish admixture above. Vertex white. Antennal ciliation minute. Body slender, pale, above mixed with fuscous.

Forewing with apex acute, termen oblique, slightly sinuous; areoles large, R^1 from middle of the outer, SC^5 from its apex; whitish, suffused with cream-buff; markings fuscous; basal patch small, obsolete posteriorly; cell-mark black, slightly elongate; median band narrow (circ. 1·5 mm.), not intense, darkest at edges, slightly constricted about cell-mark (which is on its proximal edge) slightly outbent in middle; subterminal consisting of rather large white spots, that in cellule 4 elongate proximally (tapering); some weak dark irroration bordering the subterminal, developing a fairly strong proximal spot close to costa and a larger, somewhat elongate one in cellule 5, just crossing into cellule 4; a slight oblique apical dash.—*Hindwing* rather narrow, termen slightly prominent at R^1 and very slightly at M^1, faintly sinuate inward between R^1 and R^2; DC strongly oblique, rather weakly biangulate; white.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Geometridæ from Upper Burma.

GEOMETRIDÆ FROM UPPER BURMA.

EXPLANATION OF PLATE II.

Fig. 1. *Krananda orthotmeta*, Prout sp. n.
,, 2. *Heterolocha segregis* ,,
,, 3. *Cleora coniozona* ,,
,, 4. *Boarmia virguncula* ,,
,, 5. *Loxotephria perileuca* ,,
,, 6. *Ectropis pulvicopia* ,,
,, 7. *Cleora cryptogonia* ,,
,, 8. *Ectropis embolochroma* ,,
,, 9. *Micrabraxas anisonoma* ,,
,, 10. *Enantiodes consanguinea* ,,
,, 11. *Medasina lasiochora* ,,
,, 12. *Ctenognophos methoria* ,,
,, 13. *Hirasa plagiochorda* ,,
,, 14. *Orsonoba æthocrypta* ,,
,, 15. *Semiothisa ageta* ,,
,, 16. *Ocœlophora agana* ,,
,, 17. *Ectropis hiulca* ,,
,, 18. ,, *æthregenes* ,,
,, 19. *Sysstema aulotis* ,,
,, 20. *Ectropis zotica* ,,
,, 21. ,, *lophomeris* ,,
,, 22. ,, *chrysoteucta* ,,

Forewing beneath more coarsely irrorated, except distally ; the pattern of the upper side faintly showing through. Hindwing rather less white than above ; a sinuous postmedian line, scarcely beyond middle, strongest posteriorly ; traces of white subterminal spots, with some fuscous proximal irroration.

Htawgaw, June 1923, 1 ♂ (type) ; ' West China ', 1 ♀ in Coll. Tring Mus.

Curiously like some South American *Psaliodes*, e.g. *olivaria* Warr. Probably nearest to *ochreotincta* Wilem. (*The Entom.*, xlviii, 60) which is rather smaller, less *Psaliodes*-like, with SC^5 of forewing arising proximally to apex of areole, DC of hindwing rather more angled, etc.

* 76. *Perizoma decorata quadrinotata* Warr.

Perizoma quadrinotata Warr., Nov. Zool., iii, 122 (1896) (Khasis).

Laukhaung, April–May 1923, 1 ♂ ; Htawgaw, April–May 1923, 2 ♂♂, 1 ♀, June 1923, 1 ♂ ; Hpimaw Fort, June 1923, 5 ♂♂.

Probably Hampson (Journ., Bombay Nat. His. Soc., xii, 77)—who, however, commonly ignored geographical variation—was justified in regarding *quadrinotata* as a synonym of *decorata* Moore from Sikkim ; but as it has been provided with a name and is generally smaller and more sharply marked than the Sikkim specimens I have conserved it provisionally. The Laukhaung and Htawgaw examples are nearly like the Khasi, the Hpimaw (though also small) rather variable and on the whole paler-banded.

* 77. *Perizoma conjuncta* Warr.

Perizoma conjuncta Warr., Proc. Zool. Soc. Lond., p. 381 (1893) (Karen Hills).

Htawgaw, July 1923, 1 ♂.

The specimen is small and pale, but a little worn and may be either *ab.* or a local modification, rather reminiscent of *albofasciata* Moore. The species has been taken in numbers in the Khasis but is probably very local. As the abdomen is crested throughout, the subfamily Keys of Meyrick and Turner would throw it out of *Perizoma*.

* 78. *Perizoma latifasciata* (Warr.)

Epirrhoë (?) *latifasciata* Warr., Proc. Zool. Soc. Lond., p. 375 (1893) (Sikkim).

Hpimaw Fort, 9th to 13th August, 1923, 2 ♀♀, 14th to 18th August 1923, 1 ♂, 1 ♀.

* 79. *Perizoma maculata* (Moore)

Cidaria maculata Moore, Lep. Coll. Atk., p. 277 (1888) (Darjiling).

Htawgaw, April–May 1923, 1 ♀ (large).

Known from Sikkim, Bhutan and Assam.

* 80. *Perizoma albofasciata* (Moore)

Cidaria albofasciata Moore, Lep. Coll. Atk., p. 277 (1888) (Darjiling).

Htawgaw, April–May 1923, 1 ♂ ; Hpimaw Fort, June 1923, 3 ♂♂.

Perhaps a new race, but only the Htawgaw specimen is in good condition. All are small, especially two of the Hpimaw.

* 81. *Perizoma lucifrons* sp. n.

♂, 25 mm. Like *variabilis* Warr., except as follows :—

Head and palpus pale (or whitish) ochreous-brown. Abdomen dorsally with a transverse white line at base (often reduced to a spot but always conspicuous), followed on tergite 2 by a bright, somewhat tawny line or narrow band ; anal tuft less mixed with ochreous-brown. *Forewing* relatively slightly broader ; scarcely so strongly glossy. *Hindwing* slightly less glistening, in some lights rather less white (more tinged with grey) ; apex faintly darker-clouded. Hindwing beneath a little more powdery (white, with fine but copious dark irroration).

Htawgaw, March 1923, 1 ♂, 4th to 10th April 1923, type and another ♂ ; Sikkim, August 1909 (F. Möller) 8 small ♂♂ in Coll. Brit. Mus., 3 ♀♀ undated (O. Möller and J. F. Pilcher) in Coll. Tring Mus.

There has been a good deal of confusion over the species named *variabilis* by Warren and it is perhaps less variable than was supposed. True *variabilis* (as Elwes notes, *loc. cit.*) is a high altitude form (10,000–13,000 feet) and it is conceivable that *lucifrons* may come to be regarded as a race from more moderate elevations, though I consider it unlikely. Warren himself mixed with it other near allies and indeed his allotype ♀ as labelled by himself (but not a legitimate one, as the recorded series was '4 ♂♂, 4 ♀♀ from Tonglo') is Möller's ♀ *lucifrons* registered above. Others (Hampson, *Faun. Ind. Moths.* iii. 373, and, I regret to add, myself in preparing vol. iv. of 'Seitz') allowed the 'lumping' to stand and judged the species from material in the British Museum instead of from Warren's originals. My differentiation of *mediangularis* Prout (*loc. cit.* 259 = *mediangularia* in err. Pl. 12 *c*) is in part vitiated by this confusion, but it is at the least another very distinct race, larger and relatively longer winged. In any case the V-shaped midsubterminal mark cannot be used differentially in any of the three; it is developed in Warren's four Tonglo ♂♂ and a ♀ from Jongri but not in Tonglo ♀♀, developed is *mediangularis* allotype ♀, but weak in the type ♂, obsolete in type *lucifrons*, but strongly developed in Capt. Swann's other examples, its posterior arm thick and tinged with buff. As to the further errors regarding ab. *albimacula* Prout, see infra.

* 82. *Perizoma variabilis* Warr. (?)

Perizoma variabilis Warr., Proc. Zod. Soc. Lond. p. 377 (1893) (Sikkim).

Hpimaw Fort, June 1923, 1 ♂.

This specimen is not quite fresh, but appears to be evidently a further development of the form described by me (*Seitz Macrolep.* iv. 259) as *variabilis* ab. *albimacula*, by Warren as 'a third varietal form' (and chosen for figuring, Pl. xxx. Fig. 18, wrongly cited on pp. 377 and 434 and by Hampson as 'Fig. 17'), by Hampson as the principal form, relegating the type, together with whatever else he lumped therewith, to a brief supplementary paragraph. The Hpimaw example has the large white subterminal spot continued posteriorly, though more narrowly, almost to the hind margin. I am still inclined to allow *albimacula* to rank as an aberration of *variabilis*; and I do not think the present specimen can be a parallel variation of *lucifrons*.

* 83. *Perizoma seriata* (Moore)

Cidaria seriata Moore, Lep. Coll. Atk. p. 278 (1888) (Darjiling).

Hpimaw Fort, June 1923, 2 ♂♂.

This species is known from North India and Formosa.

* 84. *Perizoma bipartaria* (Leech)

Cidaria bipartaria Leech, Ann. Mag. Nat. Hist. (6) xix. 650 (1897) (Pu-tsu-fang, W. China).

Fenshuiling Pass (4 miles from), early July, 1923, 1 ♀.

On the hitherto unique type (also a ♀) see further *Seitz Macrolep.* iv. 259, Pl. 7 k.

* 85. *Trichoplites latifasciaria* (Leech)

Cidaria latifasciaria Leech, Ann. Mag. Nat. Hist. (6) xix, 644 (1897) (Wa-Shan, W. China).

Hpimaw Fort, June 1923, 2 ♂♂.

Both are darker, especially in median area, than Leech's unique type, which is a female. The discovery of the male proves that it belongs to Swinhoe's genus *Trichoplites*, though the discocellulars of the hind wing are not, as in the type species, biangulate.

* 86. *Trichoplites cuprearia* (Moore)

Anticlea cuprearia Moore, Proc. Zool. Soc. Lond. p. 656 (1867) (nom. praeocc. ?) (N. India).

Hpimaw Fort, 24 September, 1922, 1 ♂.

Worn, but according to the structure, etc., belonging here as a darker form, apparently not unlike an also worn specimen from the Nagas in the Tring Museum. Westward the species reaches Sikkim, eastward, I believe, West China, but it seems nowhere common.

* 87. *Lampropteryx opistholasia* sp. n. (Pl. 1, Fig. 15)

♂, 39 mm. Face broad, slightly prominent. Palpus little over 1 ; somewhat blackened. Antennal ciliation short (less than 1). Abdomen rather elongate, the lateral pencils not developed. Head and body light fuscous.

Forewing with cell less than ½ ; glossy dark fuscous, the distal area paler ; band between basal patch and median band as dark as they, separated from the former by a curved whitish line, from the latter by two slender, approximated whitish lines, the outer the sharper, bluntly angled at both folds ; cell-spot elongate, black ; median band traversed, as in the allies, by faint lunulate lines, its breadth at costa 7 mm., at hind-margin 4 mm., the fine white line which bounds it gently excurved between costa and R^2, bluntly bilobed between R^2 and M^2, acutely indented at M^2 ; sub-terminal formed of small detached lunules (posteriorly spots), the accompanying dark proximal marks anteriorly cuneiform ; an oblique white line from apex.—*Hind wing* relatively rather small, abdominal area beneath folded, containing a pencil of brown hair, a clothing of lighter hair also occupying a great part of this wing beneath, strongest about M and proximal half of M^1 and M^2 ; glossy pale greyish fuscous, almost uniform.

Forewing beneath with weak cell-dot and traces of postmedian line and subterminal dots, both obsolete towards hind margin. Hind wing with elongate blackish cell-mark, indistinct dentate postmedian line (incurved between the radials) and traces of whitish subterminal dots.

Hpimaw Fort, early July 1923, the type only.

Very near *rotundaria* Leech (*Ann. Mag. Nat. Hist.* (6) xix 659), of which it might even be the hitherto unknown ♂ but that the discocellulars of the hindwing are not biangulate. Forewing less hoary between postmedian and subterminal, apical dash stronger, antemedian less angled behind middle, postmedian more angled at M^2, cell-mark large. Unique in the genus in the transference of the sexual hair to the hindwing.

88. *Electrophaës aliena* (Butl.)

Cidaria aliena Butl., Ann. Mag. Nat. Hist. (5) vi. 230 (1880) (Bhutan).

Htawgaw, June 1923, 1 ♂ (ab.), September-October 1923, 1 ♂.

The June specimen is a pretty aberration, rather small and bright, the hindwing above less white than in the great majority of specimens of this species, beneath with the postmedian line more sinuate. One Darjiling ♂ in coll. Tring Mus. resembles it in size and coloration. The other Htawgaw specimen is typical. This form inhabits North India and I believe *tsermosaria* Oberth. from West China and an unnamed *Electrophaës* from North Tibet to be races of it.

* 89. *Ecliptopera lativittaria* (Moore)

Scotosia lativittaria Moore, Proc. Zool. Soc. Lond. p. 657 (1867) (Sikkim).

Kangfang, June 1923, 1 ♀.

This fine species is scarcely an *Ecliptopera*, but I do not at present see where better to refer it.

90. *Ecliptopera silaceata* (Schiff.) (?)

Geometra silaceata [Schiff.] Schmett. Wien., p. 113 (1775) (Austria).

Htawgaw, early July 1923, 1 ♀.

Most of the Asiatic forms referred by Hampson (*Faun. Ind. Moths*, iii. 357) to this widely distributed species have proved distinct, though closely allied ; but there remains a residuum which would seem to be really races of it and to these belongs perhaps the present specimen, which has both wings darkened, the central band of the forewing rather solid, the markings of the distal area somewhat reduced and the postmedian line of the hindwing rather distally placed. More likely, however, it is a distinct, but at present unnamed species, as has proved to be the case with a somewhat similar ♂ from Omei-Shan of which I have had the genitalia examined by Mr. Burrows.

* 91. *Ecliptopera relata* (Butl.)

Cidaria relata Butl., Ann. Mag. Nat. Hist. (5) vi. 229 (1880) (N. E. Himalayas).

Htawgaw, June 1923, 1 ♂.

92. *Eustroma inextricata* (Walk.)

Cidaria inextricata Walk., List Lep. Ins. xxxv. 1691 (1866) (Northern India).

Hpimaw Fort, August 1923, 2 ♀♀.

This species ranges from Sikkim to West China, presumably in suitable places in South China and certainly on Formosa and is represented in Japan by a race or very close ally, *aerosa* Butl.

93. *Photoscotosia miniosata* (Walk.)

Scotosia miniosata Walk, List Lep. Ins. xxv. 1354 (1862) (Sylhet).

Hpimaw Fort, 24th September, 1922, 1 ♂, June 1923, 3 ♂♂ ; Htawgaw, August 1923, 2 ♀♀.

Range : N. India to W. China, Formosa. An unnamed race on Luzon.

* 94. *Chartographa fabiolaria trigoniplaga* (Hmpsn.)

Callabraxas trigoniplaga Hmpsn., Tr. Ent. Soc. Lond., p. 312 (1895) (Nepal).

Hparê, end of August 1923, 1 ♂.

From the slender material accessible to me, I judge that *fabiolaria* Oberth. (China) and *trigoniplaga* Hmpsn. (North West and Northern India and Tibet) are races, both variable, of a single species ; the present specimen is an aberration—or perhaps slight local modification—of the latter.

95. *Dysstroma cinereata* (Moore)

Cidaria cinereata Moore, Proc. Zool. Soc. Lond., p. 662 (1867) (Sikkim).

Htawgaw, 4–10 April 1923, 1 ♂, April–May 1923, 1 ♂, early July 1923, 1 ♂, August 1923, 1 ♂ ; Hpimaw Fort, June 1923, 2 ♂♂.

Distributed from Sikkim to West China.

* 96. *Dysstroma subapicaria* (Moore)

Cidaria subapicaria Moore, Proc. Zool. Soc. Lond., p. 663 (1867) (Sikkim).

Htawgaw, June 1923, 1 ♂ ; Hpimaw Fort, June 1923, 1 ♂, 1 ♀.

Perhaps a race, the hindwing rather pale, inclined to develop a darker border. Typical *subapicaria* is known from Sikkim and Bhutan.

* 97. *Dysstroma citrata dentifera* (Warr.)

Polyphasia dentifera Warr., Nov. Zool. iii. 387 (1896) (Darjiling).

Lankhaung, 7th March, 1923, 1 ♂ ; Hpimaw Fort, June 1923, 1 ♂.

This race is distributed in North India and Tibet. The species has an enormous range in the Palaearctic Region and even in North America.

* 98. *Thera cyphoschema* sp. n. (Pl. 1, Fig 6)

♂ ♀, 24–27 mm. Head reddish brown. Palpus about 2 ; pale at base, darkened on outer side. Antenna in ♂ with rudimentary pectinations (scarcely 1), surmounted by short ciliation. Thorax reddish brown, paler beneath. Abdomen rather pale, especially beneath. Legs partly blackened, with white irroration and extremities of joints.

Forewing reddish brown, about as in average British *obeliscata* Hb. (less glossy than in *cognata* Thnb.) ; basal patch subobsolete, indicated by two faint lines (the proximal sometimes hardly traceable, the distal weakly outbent on both folds) and in the most sharply marked specimens by some slight band-like shading between them ; cell-mark elongate, oblique, black ; antemedian equally oblique, generally absorbing the cell-mark, sometimes just proximal, blackish anteriorly, right-angled at M, very faint posteriorly ; postmedian from costa 3 or 4 mm. beyond antemedian, gently incurved at first but mainly oblique outward to a projection at R^2, thence very feeble, lunulate-dentate ; veins in median area blackened, generally strongly ; some further dark shading usually present, commonly becoming blackish in the radial lobe ; subterminal line indicated, at least in anterior half, where it is accompanied proximally by some dark shading, an elongate mark in cellule 6 commonly conspicuous ; the characteristic apical dash of *Thera* rarely noticeable.—*Hindwing* whitish grey, with very faint traces of strongly excurved postmedian line.

Both wings beneath glossy greyish, the forewing a little suffused ; both with weak cell-dot and traces of curved postmedian line ; forewing with pale costal spot just outside postmedian.

Htawgaw, March 1923, 2 ♂♂, 1 ♀ (1 ♂ dated 20. iii), April-May 1923, 7 ♂♂, 5 ♀♀, June 1923, 1 ♂, early July 1923, 3 ♂♂ ; Blackrock, early July 1923, 1 ♂.

The June-July specimens are on an average smaller, probably a second generation.

The genus *Thera* is Holarctic, straggling into the Himalayas.

* 99. *Triphosa consona* sp. n. (Pl. 1, Fig. 11)

♀, 49 mm. Coloration and general distribution of the markings almost exactly as in well coloured examples of *dubitata* Linn., though with slightly more dark admixture, at least in the paler parts. Palpus blackish, with third joint rather longer than in *dubitata*. Head and body a good deal clouded with black-grey.

Forewing with the central band rather less noticeably divided into two than in most *dubitata*, the vinous shades well distributed in it ; antemedian lines more deeply excurved anteriorly than in *dubitata* and in addition with an acute outward projection at fold ; the lines between this and basal patch likewise exangled at fold ; postmedian rather straight from costa to SC^5, the double projection at R^1 rather weak and even ; the band beyond distinctly tinged with olive ; subterminal expanded into a larger white subtornal spot than in *dubitata*; the vinous band proximal to it rather strongly bisected.—*Hindwing* with termen appreciably less deeply dentate than in *dubitata* ; the lines and vein-dashes stronger ; some vinous suffusion in abdominal region.

Underside rather darker than in *dubitata*, otherwise similar.

Htawgaw, April–May 1923, the type only.

From the Indian species of the *rubrodotata* group also the angular antemedian and the vinous præsubterminal band will readily distinguish it.

100. *Anaïtis affinis* (Warr.)

Docirava affinis Warr., Nov. Zool. i. 398 (1894) (Central China).

Htawgaw, early July 1923, 1 ♀.

Previously known from Sikkim and West and Central China. The specimens quoted by Warren from ' Japan ' were certainly—like a good number of Chinese specimens in the early days of the Tring Museum—erroneously labelled.

* 101. *Chætolopha incurvata* (Moore)

Eupithecia incurvata Moore, Lep. Coll. Atk., p. 268 (1888) (Khasis).

Htawgaw, August–September 1923, 1 ♂, 1 ♀.

The taxonomic position of this very distinct species is problematical, but in any case it is certainly no *Eupithecia*. Its nearest relative is probably *rubicunda* Swinh. (*Tr. Ent. Soc. Lond.*, 1902, p. 647), from Perak, Sumatra and Borneo, which can also be provisionally included in *Chætolopha*.

* 102. *Hypenorhynchus erectilineata* (Moore)

Lygranoa erectineata Moore, Lep. Coll. Atk., p. 272 (1888) (Khasis).

Htawgaw, July 1923, 1♂, 3 ♀♀, August 1923, 1 ♀ ; Laukhaung, July 1923, 1 ♀.

103. *Collix ghosha* Walk. (form ?)

Collix ghosha Walk., List Lep. Ins., xxiv. 1249 (1862) (Ceylon).

Langyang, 14th September 1922, 1 ♂.

A worn specimen, but almost certainly referable to a *Collix* which at present stands as a possible form of *ghosha*, considerably larger and with the maculation of the underside slightly less heavy, but will probably demand separating as a species. *C. ghosha* is spread over the greater part of the Indo-Australian Region, the large form (or ally) perhaps restricted to Assam, Burma, the Malay Peninsula and Formosa (vide *Ent. Mitt.* iii. 248, No. 77).

104. *Collix* sp.

Htawgaw, September–October 1923, 1 ♀.

Likewise worn, but apparently nearest to *hypospilata* Guen, though larger and with the subterminal spots beneath less sharp. Probably a species unknown to me, scarcely possibly a remarkable ab. (still larger) of the preceding.

* 105. *Horisme flavofasciata* (Moore)

Collix flavofasciata Moore, Dep. Coll. Atk., p. 270 (1888) (Darjiling).

Htawgaw, 4-10 April 1923, 1 ♂, 14 October, 1923, 1 ♀.

A very fine pair of this apparently rare species, hitherto known only from Sikkim and Assam. Both are large, perhaps racially.

* 106. *Horisme hyperythra* (Hmpsn.)

Phibalapteryx hyperythra Hmpsn., Faun. Ind. Moths iii. 347 (1895) (Nilgiris).

Htawgaw, July, 1 ♀.

A fairly common species in India and Ceylon and reappearing in Japan, the Liu Kiu Islands and Formosa.

Parazoma gen. n.

Face without cone. Palpus rather long, second joint with long projecting hair-scales beneath, third joint well developed, somewhat drooping. Antenna in ♂ minutely ciliated. Metathorax with metallic-mixed crest. Pectus scarcely hairy. Femora glabrous. Hind tibia with all spurs. Abdominal crests scarcely developed ; terminal segments in ♂ well developed, valve broad, uncus pointed, labides long, their lower arms perhaps embracing the juxta, which appears to be tripartite, apparently no coremata. *Forewing* with much the shape, scaling and pattern of a *Perizoma* ; areole very large, undivided, its anterior margin approaching C, SC^5 well stalked with $SC^{2\ 4}$, R^1 from areole. *Hindwing* moderately ample, not continuing pattern of forewing ; termen very little waved ; DC oblique and (in the type species) generally angled (partly through the incurving of DC^2), C anastomosing to near end of cell, SC^2 stalked, R^2 about central or very slightly behind.

Type of the genus : *Parazoma ferax* sp. n.

Probably related to *Eupithecia* but quite different in habitus, in details of venation, in lacking the 'body-plate' of the 8th sternite of the ♂ abdomen, etc. From *Perizoma* it differs in the single areole, labides with heads not united, etc.

* 107. *Parazoma ferax* sp. n.

♂ ♀, 19–24 mm. Head and body fuscous, more or less sprinkled with black and white. Foreleg above blackish, marked with white at ends of joints.

Forewing rather glossy, coloured about as in dark examples of *Perizoma bifaciata* Haw. or as *P. variabilis* Warr., etc. ; a bright orange-brown subcostal line (conspicuous with the lens) almost from base to postmedian ; basal patch brown, irrorated with black, limited by a very slightly curved pale line ; intermediate band brown ; median band black, about 3 mm. in width (rather variable), not broadening anteriorly, its proximal edge more or less curved, its distal with small subcostal and (double) central projections ; cell-spot deeper black, but quite inconspicuous ; fine pale lines bounding this band, the distal one white, at costa double ; distal area brown, clearest just beyond median band ; then more or less irrorated and clouded with black (variable) ; a pale mid-subterminal spot, as in many *Perizoma* and equally variable both in size and colour—pure white or light brown ; terminal line interrupted by the veins, which are here tinged with brown ; fringe mottled.—*Hindwing* glossy dark grey, almost without markings ; a small cell-dot sometimes distinct.

Forewing beneath much more blurred, the median band more dissolved into lines. Hindwing beneath variable, but always with alternating pale and black-grey lines, the postmedian generally the strongest.

Hpimaw Fort, August 1923, 5 ♂♂, 5 ♀♀ (including the type ♂) ; Htawgaw, August-September 1923, 2 ♂♂ ; Hparê, September 1923, 7 ♀♀.

Also known to me from Darjiling, July-August 1886 (H. J. Elwes), 3 ♂♂, 1 ♂ (determined by Hampson—presumably without examining the forewing venation—as '*Larentia*? *bicolor* Warr. var.'), August 1904, 1 ♀ in coll. L.B. Prout ; 'Sikkim,' 7,000 feet, 5 ♂♂, August 1895 and September 1909, and 1 ♀ in Coll. Brit. Mus.; and ? Khasis, August 1894, 1 ♂ in Coll. Tring Mus. with DC of hindwing not biangulate.

*108. *Parazoma semifusca* (Warr.)

Perizoma semifusca Warr., Nov. Zool. iii. 123 (1896) (Khasis).

Htawgaw, March 1923, 3 ♂♂.

All three are aberrant in the obsolescence of the dark border of hindwing. This may prove racial, but I have seen at least one Khasi ♂ of nearly the same form.

Except for the non-biangulate discocellulars of the hindwing and some very secondary differences in the genitalia, this species fits well into *Parazoma*. It is not a *Eupithecia*, as Hampson (*Journ.*, *Bombay Nat. Hist. Soc.*, xii. 80) made it, lacking the body-plate of the 8th sternite, as well as differing in shape and facies.

109. *Physetobasis dentifascia* Hmpsn.

Physetobasis dentifascia Hmpsn. Faun. Ind. Moths., iii. 386 (1895) (Dharmsala).

Htawgaw, July 1923, 1♂.

Small and dark, perhaps a subspecies. The West Chinese race (?), *mandarinaria* Leech, is, however, larger and more rufescent or (a Yunnan ♂ in coll. Joicey) smallish and rufescent. Slightly different forms, again, occur in Lower Burma and Central China. A Simla specimen in coll Brit. Mus. agrees with the type. More material is badly needed for working out the variation.

* 110. *Eupithecia russeola* sp. n.

♀, 21 mm. Frontal cone sharp. Palpus moderate, second joint heavily scaled above. Antennal ciliation very short (well under ½). Head and body brownish fuscous, paler beneath.

Forewing with costa scarcely arched, apex rather sharp, termen moderately long, rather strongly oblique, straightish from apex about to R^2, thence very gently curved to SM^2, straighter again to tornus ; areole undivided ; hazel to russet, more reddish tinged than *rajata* Guen., darker than *albispumata* Warr. and without the white admixture ; costal margin more fuscous, cut by still darker marks, denoting the commencement of the lines ; cell-dot scarcely raised, rather small though slightly elongate, black, with a few whitish scales at its edges ; lines in proximal area weak, in central area scarcely noticeable, all nearly as oblique as the postmedian ; postmedian rather thick and fairly conspicuous from its anterior angle almost to hindmargin, straightish, parallel with termen, its anterior angle acute, but scarcely noticeable, the costal (inwardly oblique) arm being obsolescent, while the costal spot of the subterminal looks almost like a resumption of the postmedian ; the usual pale band outside the postmedian scarcely at all developed, its bisecting line fine and not strong ; subterminal line slight, even near the tornus only developing a small and fine white spot ; terminal line weak, interrupted ; fringe paler, especially in distal half, the proximal half feebly chequered.—*Hindwing* with costa slightly longer and straighter than is *rajata*, apex moderately rounded, termen straightish between R^1 and M^1 ; pale grey to whitish grey basally and costally, nearly concolorous with forewing distally and posteriorly, the abdominal margin also mostly darkened with broad fuscous shading ; cell-dot minute ; postmedian markings (the line itself, narrow pale band beyond, with very fine limiting line or vein-teeth) indicated except at costa ; terminal line rather more conspicuous than on forewing ; fringe as on forewing.

Forewing beneath rather paler, less reddish, much as in *rajata* ; cell-mark strong ; costal margin slightly darkened ; four costal spots present, the antemedian the weakest ; postmedian line and some faint lines in outer area indicated. Hindwing a little paler · cell-dot stronger than above ; the curved postmedian line complete, fairly distinct ; lines of outer area well indicated.

Hparè, September 1923, 1♂ (type) ; Kangfang, September–October 1923, 1♂.

The Kangfang specimen is slightly paler and (especially on hindwing) more distinctly marked than the type. Another Hparè ♂, of the same date as the type, may be a greyer aberration, but seems to have the antennal ciliation slightly less short, the postmedian line of forewing slightly more proximal, with the pale band beyond it more noticeable and associated with a pale oblique streak from apex. More probably a separate species, but not very fresh.

111. *Eupithecia* sp. n.

Htawgaw, September–October 1923, 1 ♀ (torn).

Larger and paler than the preceding, rather narrower, cell-spot of forewing rounder, central area narrower, its boundary lines more regularly developed. An extremely worn ♀ (Htawgaw, September 1922) may possibly connect it with the greyer relative of *russeola* (supra).

112. *Eupithecia* sp. n.

Hparê, September 1923, 1 ♂.

Smaller and rather more glossy than *russeola*, in shape and markings nearer to No. 110.

113. *Eupithecia robiginascens* Prout

Eupithecia robiginascens Prout Nov. Zool. xxxiii. 9 (1926) (Bhutan).

Hpimaw Fort, 14–18 August, 1923, 1 ♀.

Not very fresh, but apparently referable to this species, which inhabits N. India.

* 114. *Eupithecia tricrossa* sp. n.

♂ ♀, 17–19 mm. Palpus moderate, second joint triangularly scaled above, third joint short, pointed. Antenna in ♂ minutely ciliated. Head grey. Body above glossy blackish, with a slight admixture of metallic bluish, beneath very pale grey. Foreleg above darkened, spotted with white at ends of joints.

Forewing with apex not acute, termen gently curved, not exceptionally long; areole undivided; glossy white-grey, the markings dark grey tinged with brown (or, under a strong lens, grey-brown with minute longitudinal blackish irroration); some metallic bluish scales at base; a large black cell-spot of raised scales; basal patch and antemedian band sometimes fused together, the latter touching the cell-spot, about as oblique as termen; a postmedian band about 1·5 or 2 mm. beyond cell-spot, angled outward just before R^1, then almost parallel with termen, very slightly sinuous; fine parallel lines proximally and distally hereto; subterminal line of the ground-colour, fine, slightly crenulate anteriorly, interrupted between the medians; three dark patches proximally to it, costal, radial and tornal, the middle one tapering anteriorly to accommodate an oblique pale streak directed towards apex, the posterior one about reaching M^2; the narrow dark distal shade only interrupted at the veins; fringe weakly clouded.—*Hindwing* with apex rounded, termen rounded-prominent at SC^2 and M^1, straightish or almost concave between; light grey, slightly darkened at abdominal margin and base of M; a blackish cell-dot; a dark grey, slightly curved postmedian line (band); a slight dark shade at tornus; terminal line and fringe as on forewing.

Underside less glossy; white-grey, the forewing proximally and anteriorly more suffused, darkest on proximal part of costal margin; cell dots and postmedians distinct; proximal subterminal shade of forewing indicated, strongest anteriorly; hindwing sometimes with anterior indications of a similar subterminal shade.

Hpimaw Fort. 9–13 August, 1923, type ♂ and 1 ♀, August 1923, allotype ♀.

Also occurs in Sikkim (Darjiling, Nagrispur and Kurseong) and Bhutan (Buxa), but—like very many Indian *Eupithecia*—seems never to have been named. Hampson confused it with *atrisignis* Butl, from North-West India, which is browner, less strongly glossy, less variegated, but with the veins in middle of forewing reddened, the cell-spot generally less large, less oblique, the median area broad, antemedian line strongly curved and less oblique than termen, the oblique band-like shading obsolete, the postmedian more angled, the subterminal shade not distinctly tripartite.

* 115. *Eupithecia acyrtoterma* sp. n.

♂, 23 mm. Face without distinct cone below; dark grey. Palpus 1½, second joint heavily scaled above and especially beneath, third joint distinct; pale, with blackish irroration. Vertex pale grey. Antenna evenly ciliated, the ciliation fully 1. Body grey, apparently black-mixed on side (discoloured), paler beneath. Foreleg blackened, the joints with pale tips.

Forewing moderately elongate, costa straightish except at base and near apex, termen long, very oblique, very gently curved; areole undivided; pale grey; slightly (less than in *virgaureata* H. Dbld.) tinged with brown; dark irroration; cell-dot black, fairly large (about as in *virgaureata*); costa with indications of dark antemedian, median and postmedian spots and of dark dashes between; lines indistinct, excepting the double postmedian (which is angled near costa, much as in *virgaureata* or scarcely so strongly) and the pale subterminal (with some incomplete dark shading proximally); subterminal only very slightly expanded near tornus, here rather markedly dark-bordered proximally; terminal line black, interrupted at the veins; fringe with large but weak spots opposite the veins.—*Hindwing* rather narrow, the termen from SC^2-M^2 almost straight (only very faintly oblique outward to R^1, incurved between the radials and excurved between R^3 and M^2); rather paler than the forewing, except in abdominal region and at extreme termen; markings obsolescent anteriorly, nowhere strong; cell-dot small; subterminal spot near tornus rather large, but very little paler than its surroundings; terminal line and fringe as on forewing.

Both wings beneath paler; forewing with fairly large cell-dot, weak costal spots, faint postmedian and rather faint proximal-subterminal band; hindwing with smaller cell-dot, shadowy sub-basal and median bands (the latter just outside the cell-dot, interrupted in middle) and fainter subterminal; both with the terminal line indistinct.

Hpimaw Fort, 14-18 August 1923, the type only.

Perhaps near *virgaureata*. The shape of the wings, though foreshadowed in several Indian species, is characteristic and I think only rivalled by *quadripunctata* Warr. (1888, N. W. India), which is a large, browner species, with rather more elongate forewing, larger cell-spot, the other markings weaker, etc.

* 116. *Eupithecia anasticta* sp. n.

♀, 23 mm. Face and palpus dark fuscous; frontal tuft rather thin but sharp; palpus with second joint heavily scaled above and beneath, third joint rather strong. Occiput and collar paler. Antenna minutely ciliated. Thorax and abdomen fuscous, the thorax above rather darker; abdomen robust, with the first tergite paler. Foreleg blackened, with pale rings at ends of joints.

Forewing moderately broad, apex not acute, termen gently curved, oblique (normal), a little straighter between M^2 and SM^2; areole elongate, double (*Eucymatoge* in sensu Mey.); glossy dark fuscous (not quite as dark as *lucigera* Butl., *Ill. Het.* vii. 115, Pl. cxxxvii, Fig. 11, more like average *vulgata atropicta* Dietze); the dark irroration very fine and even, not conspicuous; cell-mark rather elongate, not intense; lines almost entirely obsolete; postmedian just discernible, a little less angled anteriorly than in *rajata* Guen., accompanied distally at costa by a small whitish spot and at the radials by almost invisibly minute dots; subterminal faintly indicated, developing two very conspicuous white spots—a small one in cellule 3 and a large one behind M^2.—*Hindwing* concolorous in posterior half, paler in anterior; a small cell-mark, followed about middle of wing by a rather broad but very weak postmedian line; whitish and dark marks near abdominal margin indicating beginnings of other (obsolete) lines; two white subterminal spots as on forewing, but rather more equal in size; fringe very weakly spotted.

Both wings beneath very slightly paler than hindwing above, the posterior part of forewing a little paler still; marked with cell-spot, rather broad but rather weak postmedian line, fine and weak subterminal, with a faint band-like dark shade proximally, and very faint indications of a bisected pale band between the latter and the postmedian.

Hpimaw Fort, 9-13 August 1923, the type only.

I have pointed out on other occasions (*The Entom.* xl. 169; *Seitz Macrolep.* iv. 274) that the splitting up of this genus on the single character of divided or undivided areole gives unnatural results. The character in question is a crux of geometrid classification and must be used with great caution. After many years' work at the family I can only agree with Pearsall (*Canad. Ent.* xxxvi. 210) that as ' Nature follows no hard and fast lines ' we must submit to the anomaly of using a character as generic in one case while rejecting it in another. Every intermediate stage is found in *Nyctobia* (proximal areole minute or dividing wall very weak, etc.), insistence on the character divides species which in all other respects appear to be closely and truly related (e.g. *Eupithecia pini* Retz. and *bilunulata* Zett., etc)., the Palaearetic group associated by Meyrick (*Tr. Ent. Soc. Lond.* 1892, p. 68) as *Eucymatoge* has no character of homogeneity as a whole (as compared with *Eupithecia*) and precisely the same variation of structure occurs in other allied genera (*Lobophora* and *Mysticoptera*, *Dasyuris* and *Dasysternica*, *Cartaletis* and *Aletis*, *Cyllopoda* and *Flavinia*, etc.). Of course much the same may be said of other artificially accepted characters—structure of ♂ antenna, number of hindtibial spurs, etc.—but as Meyrick (*Tr. N. Z. Inst.* xlix. 249-50) has laid impossible weight on the above arguments in connection with a generally more fundamental one (cf. Forbes, *Journ.*, *N. Y. Ent. Soc.*, xxv. 45) it seems necessary to refer to them here. For an able discussion of the subject see Turner, (*Tr. R. Soc. S. Austral.*, xlvi. 226-8). As regards the Indian species of *Eupithecia*, Hampson was evidently so satisfied as to their homogeneity that he neglected to examine the areole, for it is divided in three species which he refers here—*eupitheciata* Walk., *rigida* Swinh. and *acutangula* Hmpsn. (*Faun. Ind. Moths* iii. 398-400.)

* 117. *Eupithecia albispumata* (Warr.)

Eupithecia albispumata Warr., Proc. Zool. Soc. Lond., p. 384, Pl. xxxi, fig. 23 (1893) (Khasis).

Htawgaw, September–October 1923, 1 ♂, 1♀.

Both are rubbed, but they seem to agree with Warren's species.

* 118. *Eupithecia leucenthesis* sp. n.

♂♀. 18–20 mm. Face fuscous. Palpus shortish (about 1¼), rather browner, Vertex whitish. Antennal ciliation in ♂ rather short (about ½), in ♀ rudimentary. Body very pale brown, the wing-tegulae almost white.

Forewing rather narrow, apex rather sharp, termen long, slightly bowed, strongly oblique; cinnamon to orange-cinnamon, the costal margin feebly spotted with fuscous; an ill-defined whitish longitudinal streak, filling the cell and somewhat diffused behind it (notably in proximal area), distally mingling with the ground-colour but traceable at the base of the radials and obliquely forward to apex; cell-dot minute, blackish; lines very feeble, traceable in fuscous shading especially at M, where they tend to form vein-spots or dashes; postmedian sharply angled at R^1, thence parallel with termen, accompanied distally by indications of the usual pale band with fine thread-line; subterminal faint, accompanied proximally by a band of a very slightly darker shade than the ground-colour; terminal spots not very strong; fringe weakly mottled.—*Hindwing* rather narrower, costa rather long, apex rounded, termen straightish to R^3 or M^1 at M^1 very bluntly bent; whitish proximally and anteriorly, then nearly concolorous with forewing; traces of waved fuscous lines; abdominal margin darker spotted.

Underside with small cell-dots and (at least on hindwing, which is a little paler than forewing) traces of waved lines.

Hparé, September 1923, 1 ♂, 2 ♀♀.

None of the specimens is perfectly fresh, but they are well recognizable; *asema* Hmpsn. (*Ill. Het.*, viii, 107, Pl. CLII, fig. 23), known from the Nilgiris and Palnis only, is very similar, but more whitish, the forewing rather acuter, etc , and has the antennal ciliation fully 1.

* 119. *Eupithecia leucostaxis* sp. n.

♀, 22-23 mm. Head white, tinged with ochreous; face nearly smooth, terminating in a minute ochreous cone below. Palpus rather more ochreous; moderate, second joint rough-scaled above and beneath, third joint small, not distinct. Thorax above whitish, mottled with ochreous; abdomen belted with ochreous; both whiter beneath. Fore and midlegs more or less darkened, except at the extremities of the joints.

Wings fairly broad, in shape perhaps comparable with *subnotata* Haw., the termen of *forewing* scarcely even so oblique as in that species ; white, irrorated and copiously marked with ochreous, much as in *ochracea* Warr. (*Proc. Zool. Soc. Lond.*, 1888, p. 321)[1] but rather brighter ; cell-dot minute or obsolescent ; a number of fine waved lines, somewhat as in *subnotata* ; boundary lines of median area slightly stronger and with slightly stronger white lines outside them ; antemedian and the correlated lines bisinuate ; postmedian right-angled at R^1, thence slightly wavy ; a very characteristic row of interneural white subterminal spots, slightly dark-edged proximally ; no terminal line ; fringe rather paler.—*Hindwing* moderately ample, termen almost regular ; slightly whiter than fore wing, at least proximally to the postmedian the lines in this area being almost obsolete except at abdominal margin ; postmedian and subterminal more as on forewing, but weakening near costa.

Forewing beneath more suffused, but with hindmargin white ; an elongate but weak cell-mark ; the white line beyond the postmedian indicated ; subterminal spots moderately developed. Hindwing with small cell-dot, alternations of lines (not very sharp) in proximal part, curved whitish postmedian band and weak, more or less macular subterminal.

Hpimaw Fort, 9th to 13th August, 1922 (type) August 1923 (paratype). Also known to me from Yatung (Indian Tibet), Nainital, etc.

Hitherto confused with *ochracea* Warr. ; larger, more *Laciniodes*-like, with narrower white areas, more macular subterminal, etc.

* 120. *Eupithecia ustata* Moore

Eupithecia ustata Moore, Lep. Coll. Atk., p. 268 (1888) (Darjiling).

Htawgaw, April–May 1923, 1 ♂.

Differs chiefly from a figure in the British Musuem (evidently crude) of Moore's type in having a proximal projection of the brown distal coloration into the median area (at base of M^1 and M^2 and entering the cell). Might conceivably be a race of the Japanese *sophia* Butl. (*Ann. Mag. Nat. Hist.* (5) i, 444).

121. *Eupithecia eupitheciata* (Walk.)

Phibalapteryx eupitheciata Walk., List Lep. Ins., xxvi, 1720 (1862) (Australia).

Htawgaw, July 1923, 1 ♀.

One of the most widely distributed Indo-Australian species, perhaps a migrant. I can add to the localities given by Hampson (*Faun. Ind. Moths*, iii, 398) Java, Sangir, Celebes, Dutch and British New Guinea.

* 122. *Chloroclystis consueta* (Butl.) (?)

Eupithecia consueta Butl., Ann. Mag. Nat. Hist. (5) iv. 449 (1879) (Japan).

Hpimaw Fort, June 1923, 1 ♂.

The specimen is worn, but seems to agree with my series of *consueta* from Yachiaolin, Central China, which in its turn may perhaps be a race of *rectangulata* Linn.

* 123. *Chloroclystis filicata* (Swinh.)

Eupithecia filicata Swinh., Tr. Ent. Soc. Lond., p. 1 (1892) (Khasis).

Htawgaw, June 1923, 1 ♂.

* 124. *Chloroclystis chlorophilata* (Walk.)

Eupithecia chlorophilata Walk., List. Lep. Ins., xxvi. 1768 (1862) (Bhutan).

Htawgaw, early July 1923, 1 ♂.

* 125. *Chloroclystis papillosa* (Warr.)

Aëtheolepis papillosa Warr., Nov. Zool., iii. 124 (1896) (Khasis).

Htawgaw, July 1923 ; 1 ♂ ; Laukhaung, April–May 1923, 1 ♀.

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[1] Unaccountably referred by Warren and Hampson to *Asthena* and *Hydrelia* respectively, really a *Eupithecia* pure and simple.

* 126. *Chloroclystis inaequata* (Warr.)

Sesquiptera inaequata Warr., Nov. Zool., iii. 126 (1896) (Khasis).

Htawgaw, April–May, 1923, 1 ♀; Hpimaw Fort, 14–18 August 1923, 1 ♀.

These seem to agree perfectly with a Khasi ♀ in the British Museum which I believe to be correctly mated with a ♂ from the same source. The ♀♀ in this group are, however, confusingly alike, keeping pretty closely to the facies of the genotype, *coronata* Hb., while the ♂♂ vary so remarkably in the secondary sexual modifications of the hindwing that Warren has founded upon them a number of genera.

* 127. *Chloroclystis rubroviridis* (Warr.)

Gymnopera rubroviridis Warr., Nov. Zool. iii. 127 (1896) (Khasis).

Htawgaw, June 1923, 2 ♀♀.

Known also from Sikkim and Indian Tibet and I believe from Borneo.

* 128. *Rhinoprora xanthocomes* sp. n. (Pl. 1, Fig. 24)

♂♀, 17–19 mm. Face pale green; frontal cone small. Palpus $2\frac{1}{4}$ to $2\frac{1}{2}$, second joint heavily scaled, third joint less than $\frac{1}{2}$ second; pale green, marked beneath with black. Vertex, thorax and abdomen green, fading to yellowish, beneath whiter; abdomen above variably sprinkled with black, in the strongly marked aberrations with a large black band which in repose probably meets that of the forewing. Fore and midleg partly darkened, leaving pale spots at ends of joints.

Forewing pale green, slightly bluish when fresh, but easily discolouring to dirty yellowish or whitish; basal patch scarcely darkened, but bounded by a straightish black line which is thickened at costa, weakened in middle, distinct at hindmargin; median area moderately broad, bounded proximally by a rather oblique, anteriorly gently curved blackish line, which is distinct throughout or strengthened at the veins, distally by a weaker line, which is very slightly angled on R^1 and R^3, thence oblique inward but almost obsolete; a second line in the median area, parallel with the antemedian, often distinct, sometimes obscured by a more or less broad, band-like, brown and black shade which occupies the proximal part (in its narrower posterior half nearly the whole breadth) of this area; other median lines and shades only developed costally; subterminal line obsolete, its position indicated by small proximal spots between the radials, a larger, rather more proximal, costal spot and some very slight dark scaling in posterior half; terminal line black, interrupted at the veins; fringe dark-spotted opposite the veins and faintly bisected between.—*Hindwing* rather small, termen slightly prominent at R^1, then slightly concave to R^3; in ♀ greyish, with traces of darker lines, in ♂ whiter, narrowed, the abdominal margin with some long ochreous hair distally, at tornus becoming somewhat distorted, an oval ochreous androconial patch near the end of M^2 and some less well-defined ochreous scaling before.

Both wings beneath pale, weakly marked excepting the costal area of forewings; sometimes with indications of a dark subterminal band on one wing or both.

Htawgaw, June, July and August 1923, 8 ♂♂, 2 ♀♀, also a large, discoloured, rather aberrant ♀ September–October; Sikkim, a ♂ in Coll. Brit. Mus. misidentified by Hampson as *trichophora* Hmpsn.; Khasis, a few in Coll. Tring. Mus. apparently mixed by Warren with *nigroviridata* Warr. (?); ? Hpimaw Fort, 9–13 August 1923, a rather dark ♀, more regularly marked across the forewing and with the median area scarcely narrowing behind.

Nearest *R. trichophora* Hmpsn. (*Faun. Ind. Moths*, iii. 393) but with the structure and colouring of the ♂ sexual modifications of the hindwing quite different.

129. *Calluga costalis* Moore.

Calluga costalis Moore, Lep. Ceyl., iii. 480, Pl. 206, fig. 1 (1887) (Ceylon).

Laukhaung, April–May 1923, 1 ♂, 10 ♀♀, July 1923, 1 ♀.

Probably the July specimen represents a second brood; only one of the early generation is as small.

The species is widely distributed and I am not sure that *cissocosma* Turn (*Proc. Roy. Soc. Vict.* xvi. 232, Queensland) is more than a form of it.

130. *Brabira artemidora* (Oberth.)

Melanippe artemidora Oberth., Et. Ent. x., 33, Pl. 1, Fig. 6 (1884) (Askold).
Htawgaw, March 1923, 1 ♀.

Distributed from Japan and Formosa to Northern India. Should the Indian form prove racially tenable, the name of *pallida* Moore will be available for it.

* 131. *Brabira atkinsoni* Moore.

Brabira atkinsoni Moore, Lep. Coll. Atk., p. 271 (1888) (Darjiling).
Hpimaw Fort, 9–13 August 1923, 1 ♂, 14–18 August 1923, 2 ♀♀.

All are weakly marked. The species (Sikkim, Assam) seems very variable, or perhaps embraces two or three close allies, as yet not differentiated.

* 132. *Microloba bella diacena*, subsp. n.

♂ ♀. Distinguishable from *M. b. bella*, Butl. (*Ann. Mag. Nat. Hist.* (5) i. 448, Japan) by the entire, or almost entire, suppression of the dark markings of the central area of both wings, leaving only the costal markings of the forewing, cell-spots and terminal patches of both wings and sub-basal mark of hindwing. Even on the underside the postmedian line and its band-like proximal shading are much less strongly developed than in the Japanese race, though the hindwing generally shows rather strong costal spots.

Hpimaw Fort, June 1923, type ♂, 14–18 August 1923, allotype ♀. Also known from the Khasis and West China, its racial distinctness hitherto overlooked.

The name-typical form inhabits Japan, Corea and East Siberia and, so far as I have yet discovered, the Formosan form is not separable. I have not yet seen examples from Central China where more or less intermediate forms might be looked for.

* 133. *Heterophleps clityogramma*, sp. n.

♂, 37 mm. ; ♀, 35 mm. Closely similar to *sinuosaria* Leech (*Ann. Mag. Nat. Hist.* (6) xix. 548 ; Prout in *Seitz Macrolep*, iv. 188, Pl. 11 *c*, Ta-chien-lu)—*Forewing* slightly less warm brown, yet without the violet-grey tone of the allied *grisearia* Leech ; cell-mark and the dark spot which precedes it on costa enlarged ; antemedian line much more oblique, more swollen into spots at its two outward angles. That on M not quite 4 mm. from base, that on SM^2 5–6 mm. from base.—*Hindwing* paler than in *sinuosaria*, at least anteriorly.—Forewing beneath with the cell-mark elongate.

Tali, Haut Yunnan, type ♂, Hpimaw Fort, 9–13 August, 1923, allotype ♀.

The ♂ was sent me several years ago by my late friend Thierry-Mieg as '*grisearia* Leech' and no doubt others from the same source will be found in his collection, now in the Paris Museum. Both my examples are somewhat rubbed, but their agreement with one another and distinctness from *sinuosaria* are abundantly manifest.

* 134. *Cryptoloba aerata* (Moore)

Larentia aerata Moore, Proc. Zool. Soc. Lond., p. 654 (1867) (Bengal).
Hpimaw Fort, 9–13 August, 1923, 1 ♀.

* 135. *Cryptoloba togulata* sp. n.

♀, 23 mm. Face dark fuscous. Palpus about 2, terminal joint concealed ; brown, mixed at tip with whitish. Antennal pectinations rather long and lax, vertex and thorax fuscous, mixed with brighter brown ; abdomen and underside paler and greyer.

Forewing with costa arched, apex acute, termen straightish or very faintly sinuate anteriorly, rounded about R^3, thence more oblique ; areole very large, undivided ; pale indefinite buff, with slight dark irroration (small strigulation) ; rather large blackish spots beyond ⅓ and beyond ⅔ costa, the former giving birth to a straightish, band-like shade which limits a distinctly darkened proximal area, the latter marking the commencement of slighter and more ill-defined terminal shading, which is narrower posteriorly than anteriorly and has its proximal boundary curved ; a much smaller and weaker dark spot on costa near apex ; a moderate terminal spot behind SC^5 and faint indications of others at midtermen and near tornus ; cell-spot faintly indicated near proximal side of pale median area.—*Hindwing* narrower than in *aerata* Moore, rather approaching that of the *cinerea* group, the angles rounded (especially tornus), the termen straightish or very slightly sinuate between SC^2 and R^3; DC strongly oblique posteriorly, SC^2-R^1 well stalked, R^2 central (or slightly before middle), M^1 about connate, SM^2 wanting; median area at least as pale as on forewing, proximal area little darkened, with a large dark cell-dot at its outer edge, terminal dark shade rather broad but not solid, only its proximal line (narrow band) and apical part well developed.

Underside similar, but with the forewing more blarred.

Hparê, September 1923, the type only.

Possibly related to *olivescens* Hmpsn (*Journ., Bombay Nat. Hist. Soc.* xiv, 511) but very distinct. In spite of differences in size, shape, colour and hindwing venation it is just possible that it will prove to be the ♀ of *trinotata* Warr. (*Proc. Zool. Soc. Lond.*, 1893, p. 344, Sikkim), of which the ♂ type remains unique.

* 136. *Cryptoloba cinerea* (Butl.)

Lygranoa cinerea Butl., Ann. Mag. Nat. Hist. (5) vi, 228 (1880) (Darjiling).

Htawgaw, 22 August, 1922, 1 ♂, April–May 1923, 2 ♂♂, 1 ♀, June 1923, 1 ♂; Hpimaw Fort, June 1923, 3 ♂ ♂, 14–18 August, 1923, 1 ♀.

Capt. Swann's examples do not appear to differ racially from the Sikkim form. On the other hand Hampson (*Faun. Ind. Moths*, iii, 337) differentiates a very marked 'form' (race) from the North-West Himalayas.

137. *Cryptoloba etaina* Swinh.

Cryptoloba etaina Swinh., Ann. Mag. Nat. Hist. (7) vi. 310 (1900) (Khasis).

Hkamkawn, June 1923, 1 ♀; Hpimaw Fort, June 1923, 1 ♀.

Perhaps a race, or even a new but very closely related species. The ground-colour of the forewing sightly more recalls that of *olivaria* Swinh. (*Ann Mag. Nat. Hist.* (6) xix. 165) and the postmedian line has both the central curves slightly strengthened, the fine black line (the true postmedian) which accompanies the brown shade rather more interrupted than in Swinhoe's type of *etaina* and the few other examples (likewise ♂) which I can compare. The unicolorous forewing beneath, with the postmedian line costally indicated in black, the different fringes, etc., remove it from *olivaria*.

138. *Atopophysa indistincta* (Butl.)

Scotosia indistincta Butl., Ill. Het., vii, 118, Pl. cxxxvii, Fig. 19 (1889) (Dharmsala).

Hpimaw Fort, June, 1923, 1 ♂.

Widely distributed in the Himalayas and across China to Ningpo. A race or close relative is described as *A. i. opulens* Prout (*Ent. Mitt*, iii, 247, Formosa).

(*To be continued*)

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA (INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY)

BY

T. R. BELL, C.I.E., I.F.S. (Retd.)

PART XXXVI

(Continued from page 837 of Volume XXX)

Sub-family (7)—ERYNNINÆ.

Imago.—Fast flying insects with the exception of *Baracus* and all keeping generally to the trees, flying high: again with the same exception. Medium-sized insects too, but there are some that are well on the small side such as *Telicota mœsoides* and *Padraona gola.* and *Baracus* again—although this last is larger than either of the other two mentioned. This last is in colour and markings like *Taractrocera nicévillei*: uppersides brown with small subapical subdiscal spots. *Telicota, Padraona* and *Cupitha* are black or blackish-brown banded transversely with yellow, either orange or paler. *Halpe* are nearly all dark-brown above with subapical and discal semihyaline white spots at end of cell, in interspaces 2 and 3 and 6, 7, and 8. On the undersides of the hind wings *Halpe* and *Baracus* are brown or yellow with some spotty variegation; *Telicota, Padraona* are yellow with bands as on upperside; *Cupitha* is a pure yellow with large black spaces.

Antennœ.—Generally with the club having the apiculus bent at right angles and short, sharp; in *Baracus* bent slightly in a curve and in *Cupitha* not quite at a right angle.

Palpi.—With the second joint half-laxly scaled; the third joint rather minute and hidden in *Cupitha;* somewhat prominent in the others except in *Baracus* where it is most prominent; in all it is porrect or erectly-porrect.

Hind tibiœ.—Fringed in nearly all, but sometimes only slightly (seemingly naked in some species of *Halpe*); with two pairs of spurs.

Fore wing.—Vein 12 reaches costa before end of cell; cell less than two-thirds the length of costa; 3 from close to lower end of cell; 2 very variable.

Hind wing.—Vein 7 emitted a little before upper end of cell; 5 obsolete; disco-cellulars faint; 5 absent or very faint; 3, 2 from close to lower end.

Egg.—The egg of this division or sub-family is generally a dome-*shaped* structure, much higher as a rule than half the breadth; without any basal band or foundation; generally without meridional ribs, quite smooth to the eye, often somewhat reticulate or rough under the microscope; generally whitish in colour but never purely white, always slightly soiled-white, sometimes with a pinkish shade of a very pale intensity. The egg of *Baracus* is meridonally ribbed with some 17 very fine ribs; that of *Cupitha* is of the same description as those of the *Plastingiinœ* and does not really fit in here at all—it is very strongly ribbed and is red in colour; all the rest being whitish, either plain or with red blotches (*Baracus*) or tiny red dots.

Larva.—The *shape* very ordinary, thickest in middle, fining to anal end which is broadly rounded; and to the neck which is narrow compared to the head; the *head* however really rather small, round or semi-elliptical, hardly bilobed with the surface rough and covered with appressed, fine, minute hairs not in any way obscuring the sculpture or the colour. *Surface* covered with very minute, erect, light hairs, longest round dorsoventral margin and, especially on anal segment; this anal segment is nearly all roughened on dorsum with little tubercles, each bearing a hair. *Spiracles* of segment 2 particularly large. *Colour* some shade of green, the skin thin and the tracheal tubes showing through; generally without longtitudinal lines except in *Padraona gola* and *Halpe honorei*—this last has a broad, longitudinal, red, lateral band; always a collar to segment 2.

Pupa.—With the front broad, somewhat rounded; a slight boss between the eyes on frons; thorax slightly humped; cremaster generally with two points behind between which is a line of longish shafts with hooked ends. *Surface* covered up with tiny hairs, sometimes bristle-like and longer on eyes; cremaster with the sides hollowed out, the extensor ridges dorsally and ventrally strong, the dorsum between these concave. *Spiracles* of segment 2 with very large, funnel-shaped, generally brown or red-brown expansions. *Colour* generally that of an old bone, sometimes with a green shade, sometimes strongly brown; covered with a cereous, white powder as a rule.

Habits.—Eggs laid on under surface of leaves. Larvæ make cells by joining the edges of the leaf or blade at the point. The cell eventually cut free and falls to the ground; always lined inside with silk and, generally, white cereous powder from the pupa dusts the sides. Larva eats bamboos and grasses and, exceptionally, only in the case of *Cupitha,* deciduous trees which is altogether abnormal. But, any way, *Cupitha* makes a bad fit in the sub-family whatever way it is looked at. The only thing that can be said is that the genus fits better into it than into any other.

Genus 25.—TELICOTA.

There are three species of this genus in British India according to Watson: *bambusæ* (M.); *augias* (L.) and *palmarum* (M.). Swinhoe reverts to Mabille's *Corone* for *palmarum* owing to the position of veins 2, 3 of the fore wing; and he gives twelve other species (of *Corone*) as existing in the Malayan subregion. There are four *Telicota* from the same area. The three Indian species are all dark-brown or blackish insects with golden-yellow or orange, transverse bands of contiguous spots on the fore and hind wings on the upperside and with the undersides suffused with yellow in the males, the bands showing through it more or less; the females having narrower bands in two of them while the female of *palmarum* is all brown with the markings duller, not yellow at all. They are all medium-sized insects of powerful flight, very quick on the wing; they rest on the tops of leaves, taking short flights, returning constantly to the same place.

Imago.—As above.

Antennæ.—More than half the length of the costa of fore wing; club stout, with a short, pointed, terminal crook.

Palpi.—Upturned, the second joint somewhat laxly scaled; third joint suberect, somewhat prominent, bluntly conical.

Hind tibiæ.—Fringed and with two pairs of spurs.

Fore wing.—Vein 12 ends on costa some distance before end of cell; upper discocellular minute, middle and lower in an inwardly-oblique line, the middle the longer; vein 5 from their junction rather close to lower end of cell, vein 3 nearer to the end of cell, quite close to it, in the female, further from it in the male (in *Corone* closer still to end in both sexes); vein 2 a little beyond the middle in the male, rather nearer the end in the female for *Telicota,* before the middle in *Corone;* costa very slightly arched before its middle; cell rather long, very little less than two-thirds the length of costa; apex subacute; outer margin convex, somewhat shorter than the hinder margin; wing narrow, the oblique outer margin giving the outer portion of the wing a narrow, triangular shape.

Hind wing.—Vein 7 from well before upper end of cell, the cell-margin bent down from base to cell-end; discocelluars outwardly-oblique, faint; 5 absent; 3 from close to lower end of cell, 2 from twice the same distance from margin of 3 in *Telicota,* close together in *Corone.* All male *Telicota* have a linear discal stigma on the upper side of fore wing, extending, in *bambusæ augias* and *palmarum,* from the lower end of cell to the middle of the submedian vein with veins 2, 3 passing across it, dividing it often into three sections; this stigma bluish-greyish in colour, running through the black band between the basal and discal orange markings. In *maesoides,* the male has a short, glandular, black streak along the sub-median vein across the black between the same markings.

Egg.—High dome-*shaped.* The *surface* unsculptured. *Colour* whitish with a slight pink tint.

Larva.—Of ordinary *shape,* broadly rounded at anal end, the dorsum of anal segment roughened; the neck small, compared to the *head* which is round and yellow or black with a rugose surface covered with tiny, appressed hairs that obscure neither sculpture nor colour. *Surface* of body covered with minute, erect hairs, longer round the dorsoventral and anal margins; the skin thin showing tracheal tubes underneath. *Spiracles* of segment 2 very large; of segment 12 smaller; the rest smallest. *Colour* green; unmarked.

Pupa.—Broad in front, with a well-developed cremaster; of ordinary shape; the cremaster with strong extensor-ridges and ending in a truncated extremity with a small tooth at each corner and with a fringe of longish shafts, either hooked or not, at ends; head with a slight convexity between eyes; proboscis slightly produced free beyond ends of wings. *Surface* of pupa covered with short, erect hairs, denser and stronger on eyes. *Spiracles* of segment 2 with very conspicuous, large, strainer-shaped expansions. *Colour* brownish and covered with a cereous, white excretion.

Habits.—Egg laid on underside of leaf. Larva makes a cylindrical cell at point of leaf by joining edges; small at first; new cells as required; eventually, when about to pupate, cuts it free upon which the cell falls to the ground. Butterfly is a powerful flier, keeping to the higher parts of trees.

215. Telicota bambusæ, (M.).—(Pl. M, figs. 75♂, 75*a*♀).—Male. *Upperside.* Fore wing with the ground colour black or very dark-brown that is nearly black; but every interspace between the veins from base outwards to stigma, continued along costa above stigma and along inner margin below filled in with light golden orange leaving a band of ground colour all along the outer margin through which the ends of the veins that come through the orange are slightly orange-bordered at where they leave it; the vein forming the bottom of cell and vein 1 and often, also, the vein forming top of cell are black through the orange from base and all veins from the stigma outwards through the orange (but not inside stigma) are thinly black, including 8 to 11 on the costa; the black band containing the stigma is slightly broader than the stigma itself and is continued beyond it outside the cell to vein 6, embracing the inner halves of interspaces 4, 5. Hind wing. Ground colour black; the markings also golden-orange—a large spot towards end of cell disconnected from much larger, quadrate—elongated spots forming a transverse band in interspaces 2, 3, 4, slightly extending upwards into interspace 5 and confluent across interspace 1 by a broadish neck with a yellow streak that borders the outer edge of vein 1*b* from base to outer margin—the transverse band about 2.5 mm. in width. On the fore wing, under the median vein there is a slight covering of decumbent, orange hairs from base outwards to vein 2 and a similar covering over the whole of the orange mark along inner margin under vein 1 but there is no fringe, or very little, along the inner margin. On the hind wing there are quite a lot of longish, orange hairs in the cell, underneath it in interspace 1*b* right out to outside edge of the transverse orange band and in interspace 1*a* still longer, denser hairs, not quite so decumbent, right out to outer margin. *Underside.* Fore wing golden-orange but the posterior spots of the discal spot-band much paler, showing through; the base of the wing in the cell to about one-third its length and below it right out to the inside edge of the discal band including the whole of interspace below vein 1 along inner margin and outside discal band upwards to vein 2, all black; the bases of interspaces 4 and 5 are very slightly blackish up to half way out, the costa is thinly black, the marginal black band of upperside shows through also slightly blackish and there are blacker small spots, one in each interspace 2 to 8 limiting the blackish outer border from the orange discal band. Hind wing orange, the discal band showing through golden-orange, little blackish border-spots in each interspace limiting the discal band outside and inside. *Cilia* above yellow with basal third brown, the actual border of the wing finely black, showing very distinctly on the undersides; below the very bases of cilia are yellow and the middle rather broadly tinged brown.—Female. *Upperside* not so black; the orange markings reduced a good deal in size. Fore wing with the base of cell black extending outwards along bottom of cell to middle of it which is again black; the black band that bears the stigma in male extends right in to the base in interspace 1 leaving only a streak of orange above vein 1 and touching it; the edge of costa black right down to base whereas, in the male, it is black only in the outer half. Hind wing as in male. *Underside* like the male but the black more extensive, following the upperside in the fore wing; in the hind wing the colour is more dull-yellow than in the male, the discal band perhaps rather more conspicuous. Antennæ black above, orange beneath except a narrow black band at edges of joints, the club with the end half, including point dull-red below; palpi, head, thorax and abdomen above concolorous with the orange of wings, the long hairs of thorax mixed with brown ones imparting a greenish shade, the abdomen banded black; below uniform bright-ochreous, the tibiæ and tarsi orange. Expanse 35 mm., the male rather less.

Egg.—The *shape* is that of a high dome with a very short, cylindrical base of 0.05 mm. in height above which is the broadest part; top somewhat flattened and 0.44 mm. in diameter, a circular area. *Surface* only slightly shining with some minute, irreruglarly-disposed and irregularly-shaped rugosities; the micropyle small, apical, nearly smooth, darker than the rest. *Colour* white with a delicate pink shade. B: 1.05 mm.; H: 0.85 mm.

Larva.—The *shape* is that of *Telicota, Halpe,* etc.: body cylindrical but with the ventrum rather flattened as the legs and prolegs are short and the caterpillar lies rather closely applied to the resting-surface; the anal end broadly and semicircularly rounded, the anal segment rather large, somewhat flattened on dorsum, very slightly bordered tumidly round the free edge and considerably roughened dorsally on the whole surface, with the usual six comparatively long hairs from the free edge all round as well as others much shorter (which cover the whole body); segment 13 about one-third the length of segment 12 but quite well-distinguished and rather waved as to hinder margin; segment 12 about equal to segment 14 in length, perhaps even shorter; segment 11 coequal with 12. *Head* nearly round with a distinct, triangular sinus on vertex, the face not very convex; the true clypous just about one-third the height of head, an isosceles triangle, acute at apex; the false clypeus outside it with straight margins quite parallel to those of the true clypeus all the way to base, reaching about two-thirds the height of face, acute-apexed; surface of face very rugged seen under the lens, covered with more or less decumbent, very short, fine and lightish hairs, with some slightly longer about mouth-opening; the labrum transverse, reddish-shining; the ligula white, black-bordered, not very large with a frontal, triangular sinus; the antennæ more or less colourless in both joints; the mandibles dark-brown with reddish bases when exposed; the eyes brown; the general colour of the head is soiled whitish obscured, however, by a dark red-brown band along the hinder border though not quite reaching it, this band widening out below to include the whole of the eye-area and joining on to a broad, similarly coloured band down the middle of face (dorsal) that splits down the false clypous, including it but not the true clypous which remains the ground-colour except for a somewhat bold dorsal line from apex to base; thus all that remains of the white ground-colour is a large oval space on each lobe from vertex to base and the true clypeus. *Surface* of body covered with extremely minute, erect, light, fine hairs all over amongst which the subdorsal one and a spiracular one, arising each from a small, dark tubercle, only are seemingly twice as long; the usual transverse fine impressed lines towards hinder margin of each segment; otherwise surface dull and smooth. *Spiracles* somewhat small, light yellow or yellow; those of segment 2 very large, outlined very thinly dark; those of segment 12 smaller than those considerably but larger than the rest; all flush or nearly so and rather broad. *Colour* grass-green of a medium shade with segment 2 rather whitish, segment 14 somewhat soiled; the ventrum and legs, both true and prolegs, lighter. The skin is translucent and shows all the tracheæ through as well as the pulsating, paired, yellow bodies dorsally on segment 10 (in the male?). L: 24 mm.; B: 4 mm.

Pupa.—In *shape* the body is cylindrical, slightly broadest at shoulders whence the decrease in diameter is extremely gradual to the anal end, segments 11-14 decreasing cone-wise, the apex of the cone, segment 14, being composed of a very short, transverse, annular piece, (i.e., very much shorter than broad) with a large, trapeze-shaped, flattened piece proceeding from its end horizontally backwards, broadening to end, the dorsum of this trapeze with a strong ridge on each side (sub-dorsal or dorsolateral), these two ridges diverging backwards and each ending in a flat deltoid tooth—or it would be more correct to say that the trapeze-shaped piece bears two ridges, diverging, losing themselves towards the extremity of the piece or pupa and not quite forming the lateral margins of it; the square or straight end of the piece is fringed with a close row of stiff, hooked bristles which are reddish in colour and nearly one-third as long as the whole trapeze; segment 13 a very short, transverse piece; very much shorter than 12; 12 a little shorter than 11; *head* with the vertex parallel to the axis of body, half as long again as segment 2 which, with the front slope of thorax and head-vertex lies in a plane inclined to the longitudinal axis of the pupa at an angle of about 30° ; the frons of the head in a plane at right angles to the longitudinal axis, rather broad and little convex forming the front of the pupa ; the eyes prominent ; the margins of head and segment 2 quite straight ; thorax hardly humped at all, nearly parallel to axis of pupa in its hinder two-thirds with the rest of the dorsal line of abdomen ; the hinder margin of thorax a quarter-circle curve meeting the wing-lines in a not very broadly rounded angle of nearly 90° ; segment 4 slightly longer in dorsal line than 5 which, again, is only half the length of 6 ; proboscis produced free beyond wings to not quite the middle of the succeeding segment 9. *Surface* of pupa distantly shallow-punctate and fine-aciculate-lined transversely ; the bevelled edges of segments 8-11 non-existent in front (segments 9-11) and longly-sloping, smooth behind (segments 8-10), the sloping surfaces over-hung by a single row of reddish bristle-like hairs projecting from their anterior limits backwards over them and about as long as the surfaces. *Spiracles* of segment 2 indicated by a thick, raised half-funnel (semicircular) occupying the front margin of segment 3 and as broad as half length of segment 2, as long as the same segment (twice as long as broad that is) and the same colour as pupa with a plush-like bloom on it in certain lights ; the rest of the spiracles small, oval, nearly flush, slightly lighter in colour than the rest of the pupa. *Surface,* besides, covered with short, erect, reddish hairs all over, the eyes fringed before and behind, the hairs all extremely short, longer on anal segment and eyes. *Colour* burnt-sienna brown, reddish all over, the cremaster darker, the thorax duller, the wings like the thorax, L : 18 mm. : B : 4.5 mm. nearly.

The head is slightly bowed and little less in transverse diameter than the shoulders which are the broadest part of the pupa ; the apex of thorax is the highest point.

Habits.—The egg is laid always single, near the point or at the very point of the leaf on the upperside. The little larva makes a cell by lying on the midrib at the point and drawing the edges of the leaf together over it ; and at each stage, the larva makes a similar cell, each time to suit it in size, lining the inside with silk. The pupa is formed in a cell of two or three leaves drawn together to make a cylindrical house which fits closely to the pupa, and is dusted with a cereous excretion from the larval body that makes its appearance first between the first pairs of prolegs and before the first. The pupa is of course covered with this and is attached by the tail inside lightly to a thicker pad at the closed end of the cell—one end remains, though closed outwardly, unfastened by silks through which the emerging butterfly can easily force its way. The different stages and states of the larva and egg, larva and pupa are normal in duration at all times as far as one has been able to observe.

This is mostly an inhabitant of regions of fairly heavy rainfall ; it is common wherever there is bamboo-growth which is practically confined to places where the monsoon is strong. It thus comes about that it does not exist in the absolutely open country and mostly is found in hills and jungles. Swinhoe, in his *Lepidoptera Indica,* vol. x, p. 249, gives the habitat as India, Burma, Ceylon, Andamans and the Malay Peninsula ; says that the types are from Calcutta and that it is a very common species all over India up to the Himalayas and has been recorded from many localities, adding, "our figures of the larva and pupa are from Davidson's original drawings not previously published". These together with the butterflies, are contained in the book on Pl. 813, fig. 3, the male, 3*a* the female and 3*b* the underside, with 3*c* the larva and pupa, these last two very bad and sausage-like reproductions of the originals.

The figures in coloured Plate M accompanying these papers of the male, 75 and the female, 75*a* are good enough in the shape and accuracy of the markings, but the female is too pale as compared to the other; the *cilia* are too pink in places, or red; the underside of the male hind wing is too grey—it should be yellow; the spots too red and the body is altogether too dark.

216. **Telicota augias**, (**L.**).—Male, female. Like those sexes of *Telicota bambusæ* except that they are paler all round and, perhaps, a trifle larger. The main difference appears to be that the golden-orange of *bambusæ* is here golden-yellow, extending from the outer edge of the discal band along upper sides of the veins to practically the outer margin on the fore wings.

Swinhoe states in *Lepidoptera Indica,* vol. x, p. 249, that, in *bambusæ,* there "is a blackish streak near the anal angle on the underside of the hind wing in each of the two anal interspaces." That is certainly not present in a large series bred in the Kanara District. The two species are so extraordinarily alike that anybody might be excused for mistaking them for one and the same if it were not for the difference in genital armature discovered by Elwes and Edwards (*Trans. Zool. Society* of the year 1897, p. 251, Pl. 25, Figs. 62, 62*a* and 63) confirmed lately by Mr. W. Ormiston, F.E.S. in a paper entitled "Genitalia of some Ceylonese Hesperiadæ" published in the *Report of the Proceedings of the Third Entomological Meeting* held at Pusa, February 3, 1919, vol. iii, p. 1024, Pl. 171, Figs. 25 and 26. All that appears to be known of the earlier stages of *augias* are the remark that "the larva feeds commonly on cane-leaves and is also said to feed on bamboos and rice rarely, but is scarcely a pest" contained in the same Report, vol. I, p. 116 in the second paper read, entitled *Annotated List of Indian Crop-Pests by the* Imperial Entomologist, Mr. T. Bainbrigge Fletcher, R.N., F.L.S., F.E.S., F.Z.S. The 'cane' is sugar-cane, a grass; not *Calamus,* the cane that is of the *Palmaceæ.*

Swinhoe gives the habitat as Sikkim, Assam, Central and Southern India, Burma, Siam, Andamans, Ceylon, Hongkong, Formosa, Malay Peninsula, Malay Archipelago and says "A common species in most of the above-mentioned localities; we took many specimens in Mhow, Poona and Bombay; Elwes records it also from E. Pegu and the Naga Hills; Manders from the Shan States; Druce from Siam; Watson from the Chin Hills; Aitken from Nasik and Betham from the Central Provinces." It is common above the Western Ghats in the Dharwar District also, but it is not to be found in the N. Kanara District either below the Ghats or where there is very heavy rainfall—the rainfall varies from 400 inches on the crest of the Ghats to 100 and over on the sea coast, and 30 inches or even less on the eastern limits. It is probably altogether confined to the open country where rainfall is light.

217. **Telicota** (=Corone, *Mabille*) **palmarum**, (*M.*).—Male. *Upperside.* Fore wing—golden-ochreous, colour very similar to that of *augias,* the costa and all the veins and a line through the middle of the cell blackish-brown; outer-marginal border blackish-brown, broadest at the apex and hinder angle, its inner margin sinuous and curving inwards opposite the cell, then gradually widening hindwards; a blackish-brown streak from the base running immediately below the median vein and expanding gradually outwards, narrowing at

the cell-end and expands into a patch outside the cell which reaches the costa, being somewhat constricted in its middle; the submedian vein heavily blackish-brown. Hind wing blackish-brown, some golden-ochreous hairs at the base and along the abdominal area; a somewhat large, golden-ochreous, oval spot at end of cell and a somewhat broad, short, discal band of the same colour, divided by the blackish-brown veins, from a little above vein 6 to near the internal vein; with a thin, golden-ochreous streak running from this end to the margin. *Cilia* of fore wing blackish-brown; of the hind-wing golden-ochreous. *Underside* orange-ochreous. Fore wing with the basal half of the cell and all the basal space below it dark blackish-brown; this colour running narrowly to the cell-end and along the hinder margin leaving a costal streak, the outer half of the cell and a discal band from the costa orange-ochreous curving well outwards, then inwardly-oblique to near the hinder margin, divided by the veins into elongate, subquadrate spots which increase in size hindwards; costa and outer-marginal lines finely blackish-brown. Hind wing uniformly orange-ochreous, darker than the fore wing, the discal band as on the upperside, divided by the veins and finely edged on both sides with blackish-brown. Antennæ black, the upper half of shaft with minute, ochreous dots on its underside and a smear of the same colour on the lower half of the club; palpi ochreous and blackish-brown; head dull-ochreous with a transverse brown band in front and another behind; thorax with ochreous setæ; abdomen with indistinctly similar-coloured bands; on the underside: palpi, body and legs are of the colour of the hind wing.—Female. *Upperside* chocolate-brown, the markings dull brownish ochreous. Fore wing with a large spot at end of cell and a narrow band divided into spots by the veins, commencing very narrowly on the costa by the apex, angled almost acutely outwards, then oblique and almost straight to near the middle of the hinder margin, gradually broadening hindwards. Hind wing with indications of the small cell-spot and with a discal band, much narrower than the discal band of the male. *Cilia* of fore wing brown, of hind wing ochreous-white. *Underside* paler and duller in colour; markings similar. Expanse: male 40-42 mm.; female 45-50 mm.

Larva.—Feeds on date and cocoanut palms (*Indian Museum Notes,* V, No. 3, p. 126, Pl. 9, larva) ' . . . there is no picture of the larva in that plate, only the male and female butterfly are shown.

Habitat.—Sikkim, Assam, Bengal, Burma, Nikobars.

Distribution.—The types come from Calcutta; it is a widely spread but rare speceies; our description and figures are from a male in our collection from the Khasia Hills and two females from Maulmein in the Hankook Museum, Newcastle, taken by Adamson in January 1879; Elwes records it from the Karen Hills, Margharita, in Upper Assam and from Perak; de Nicéville from Sikkim and Cachar; Watson from Beeling in Burma and the Nikobars.'

In the *Indian Museum Notes* under the reference noted above, it is definitely stated that this insect was bred in Calcutta in December 1900. Hence it may well be found in the Plains somewhere else.

218. **Telicota mæsoides** (*Kollar*).—Male. *Upperside.* Fore wing with the cell ochreous-orange, rather lighter than the golden-orange of *bambusæ,* the costa above it similar as far as the basal half of interspace 9, the rest of that interspace blackish-brown, the upper and lower borders of cell also brown at base of wing; interspace 1 below the cell from base sprinkled rather thickly with ochreous-orange scales out as far as to and below the junction of vein 2; interspace along the inner margin below vein 1 pale-yellow at base becoming ochreous-orange outwards and finishing about three-quarters the way to tornal angle; a postmedial band of ochreous-orange spots filling the interspaces 1 to 8 from vein to vein, the lowest spot longest, triangular, its outer border very slightly excavated and more or less in a line with the end of the yellow streak along the inner margin of wing, its apex on vein 1 and reaching to about 1.5 mm. of the basal, ochreous-orange powdering of scales; interspace 2 with the spot quadrate, about the middle of interspace, outer side slightly excavated, inner slightly triangular, about 1.5 mm. broad; the one in interspace 3 rather more than half the width of last and about as long as last but very slightly dislocated outwards, square on inside edge, slightly excavated

on outer; in interspaces 4, 5 narrower, shorter, their inner edges in a straight line and dislocated outwards about two-thirds the length of the spot beneath (in 3), their outer edges also in a straight line and also very slightly excavated; above this, in 6 and 7 the spots fill the basal halves of interspaces so that their broad outer edges only reach slightly beyond the inner edges of those in 4, 5, their pointed inner ends not quite reaching end of cell; above again in interspace 8 there is a shorter, quadrate spot filling more than the middle third of the space; all this leaves the ground colour showing as a broad, brown outer border and a thinner discal band broadest below, narrowing in base of interspace 2 and still more in base of 3 to widen out considerably in 4 and 5 which is connected by a very narrow neck at upper, outer angle of cell with a small triangular brown portion on costa composed of the base of interspace 8 and the outer half of 10 with a little of the outer end of 11; there are a few ochreous-orange, decumbent hairs under the bottom of the cell inside the junction of vein 2 but there is hardly any fringe of hair along inner margin. Hind wing: similar in colour to fore wing with the markings of a similar colour:—a more or less blurred, smallish spot in base of interspace 7 and another slightly larger half way out; a larger clear one in end of cell but not touching discocellulars or upper or under margin; a broad, discal band, also clear consisting of a spot in each interspace 2, 3 not quite reaching their bases and stretching out to nearly two-thirds their length, these the largest with, above, another quadrate, smaller, dislocated well outwards in interspace 4 and a bit of 5 and, in interspace 1*b*, another about half the length of the largest, placed about the middle of the lower side of the largest and connected with a similar one in interspace 1*a*; finally a streak below vein 1*a* a good deal longer than the last spot; in the cell there is a tuft of ochreous-orange hairs in the base and some more, decumbent, in the rest of cell; also some sparsely distributed over the surface below the cell and outwards and a ridge of longer hairs below vein 1*b* from base to the end or outside of the discal band. *Underside.* Fore wing similar to upperside but duller, the whole base of cell, the whole of interspace 1 and the whole of that below vein 1 along inner margin blackish-brown except the lowest spot of the discal band which shows through; this brownish-black continued upwards to occupy the base in interspace 2 inside the discal band-spot and further up still into the base of interspace 3 to be continued as a mere line along the discocellulars to upper end of cell; outside this, further, there are slight brown borders limiting or indicating the inside and outside limits of the band-spots in the interspaces 2 to 8, the whole of the blackish-brown intervals of the upperside being here covered with duller orange scales right out to termen and right up to costa except in interspace 2 where the outside limit of the band-spot is a triangular continuation of the black of inner margin and end of interspace 1; the termen of the wing is finely black. Hind wing. Ochreous-orange but the discal band as well as the cell-spot and spots in interspace 7 paler than on the upperside but just as large, all the rest of the wing powdered thickly with orange scales, each inside and outside border of all spots rather less thickly than the remainder of surface producing a mottled-spotted appearance; but the two anal interspaces beyond the discal band immaculate blackish-brown in a patch not reaching termen nor reaching abdominal margin and the termen is finely black from costa to vein 2. *Cilia* of fore wing above brown with tips of those in the vein-interspaces orange becoming more orange towards tornal angle; of hind wing nearly completely orange, except the extreme base and at ends of veins 2, 3 which are brown; underside of hind wing orange without brown bases but ends of 2, 3 very slightly brown; forewing with the cilia orange in interspace 1 and at angle, the rest with the basal half yellow, the outer half brown except extreme tips which are alternately brown and yellow. Antennæ black, banded broadly yellow below on shaft and having the whole of club yellow below except the extreme crook which is dull-reddish; palpi yellow below, the third joint and top of the second brown; head and thorax above mixed orange and yellow with some brown hairs; abdomen brown mixed with some orange hairs; beneath: yellow with a slight green shade, end segment of abdomen and legs more orange.—Female. *Upperside.* Both wings exactly like the male but with the blackish-brown more extensive, the spots therefore rather smaller, the cell of fore wing with upper border more prominently brown and with a brown line from base half way towards its end through the middle. All the rest as in male. Expanse 25 mm. for female; the male a little less.

Larva.—The body is of the *shape* of that of *Telicota bambusæ* except that the anal segment is rather longer-semicircular and overhangs the anal claspers behind, is about the same length as segment 12, is roughened on the dorsal surface though not tuberculate and is covered with minute, erect, soft, light hairs and there are eight much longer hairs (about as long as segment 13) round the free margin with a few shorter ones between them, all these marginal hairs pointing straight out at right angles to the margin; segment 13 is a parallel-sided, transverse piece between half and one-third the length of segment 12; the body is thickest in the middle but is rather slight throughout; there is a distinct neck and the head is, as usual, large in comparison to it; the body reminds one of the larva of *Parnara kumara* because the colour is whtish light-green and there are seven parallel lines across each segment starting at hinder margin and ending at about three-quarters the length forwards: these lines all parallel to the segment margins—transverse to the length of the body as usual; *head* triangular in shape—another difference to *Telicota*—and thick, the surface shallowly rugose but not honeycombed; the true clypeus reaching less than half the way towards vertex of head, longly triangular, the false clypeus reaching slightly more than half way up, also triangular, both with the apices acute, the strip formed by the latter nearly as broad as the true clypeus; the labrum narrow, short, red-brown; the ligula nearly circular with a triangular indentation in front margin and depressed from point of this sinus backwards, colour soiled, watery white; antennal, basal joint like the second joint: colourless tinged with red-brown; mandibles red-brown margined black, the cutting edges straight; eyes: four very close together in a curve, the 6th in continuation of 3, 4 but spaced twice as far from 4 as 4 is from 3; 5 forming an equilateral triangle with 4 and 6, behind them, glass-like; colour of head whitish or very light yellow, the hinder border narrowly black, a black cheek-stripe from each eye-curve up to vertex (this often coalescing with marginal black), another black stripe running down from vertex on each side of dorsal line (often coalescing with each other) to apex of false clypeus and splitting down its sides, the false clypeus itself often all black separated by a thin, light line from the last stripes and from the true clypeus, a dorsal, brown line on true clypeus. *Surface* of larva covered with extremely minute, black, pointed tubercles, each surmounted by a tiny colourless hair, except anal segment and segment 2; transverse, thin, impressed, parallel lines as already mentioned to each segment; segment 2 with a thin, black, chitinized, transverse collar. *Spiracles* oval, very light yellow, slightly raised, small; those of segments 12 and 2 twice the size. *Colour* glaucous whitish-green allowing the dorsal vessel (appearing darker green), the thin, white tracheæ and (in the male) the orange paired bodies near hinder margin of segment 10 to be seen through it; the anal segment not coloured in any way, segment 2 white: there are a few (2-4) minute disc-like tubercles of a light brown colour dorsally in the middle of segments 12 and 13—in a transverse row. L: 25 mm.; B: 3 mm.

Pupa.—More or less of the *shape* and facies of *Telicota bambusæ;* the colour is also similar but the main difference that strikes an observer is that, here, the cremaster is always directed slightly upwards; the *head* is square in front though slightly convex (frons) between the eyes which are prominent, the frons is in a plane at right angles to the longitudinal axis of the pupa, the vertex is inclined thereto at an angle of 30°; segment 2 is parallel-sided, in the same plane as vertex of head and half its length; the thorax is only slightly humped, stout, evenly convex, highest a short way behind the front margin with evenly rounded shoulders which have a small, slightly roughened, low tubercular spot on their points, the front third of thorax sloping up at the same angle as segment 2 then gradually changing to the long hinder slope at a smaller angle in the opposite direction to the hinder margin which is a somewhat long, parabolic curve meeting the wings in a rounded, deep, rather broad angle of about 45°, this hinder margin flush with segment 4; segment 4 equal in length to segment 5, its hinder margin strongly curved backwards, that of segment 5 much less strongly curved; segment 6 one-third longer than 5; segments 11, 10, 9 telescoped into segments 10, 9, 8 respectively; segment 13 the same length as segment 12 which is half 11; segment 14 about the same length as 11 but falling away ventrally, the dorsal portion square bounded on each side by a strong, thin extensor-ridge ending in a point or short tooth-like spine at each hinder corner, the space between these ridges (dorsal area) rather deeply concave, the whole segment turned up at an angle of about 35°

to longitudinal axis of pupa; greatest breadth of pupa at shoulders; transverse section circular; proboscis produced free to end of segment 9 though pressed against surface; antennæ reaching two-thirds of the way towards ends of wings. *Surface* of pupa very nearly smooth, very shallowly and distantly pitted, covered sparsely with semi-decumbent, short, reddish, stiff hairs from, each, a minute, darker spot or dot; the cremaster fringed along the hinder margin and outside each tooth on each lateral margin by a dense fringe of reddish, porrect hairs as long as segment 11; a sparse tuft of hairs in front of each eye as well as on the back of each eye and a similarly thin tuft on convexity of frons—these hairs rather shorter than the cremastral ones. *Spiracles* of segment 2 have a very slightly raised, large semi-circular 'expansion' behind each, lying on the surface of thorax and shelving very gently forwards towards the angle made by the hinder margin of segment 2 and the antenna where the perforation of the spiracle is situated, this expansion being as broad as segment 2 is long; other spiracles small, oval, raised, light red-brown. *Colour* of pupa dull, light orange, darker on thorax and head; the cremaster shining red-brown. L: 16 mm.; B: 3.75 mm.

In the male of this Kanara species, above described and named *mœsoides* by Swinhoe (see *Lepidoptera Indica,* vol. x, p. 258), there is a short bar of whitish-grey, glandular hairs, all directed outwards along the vein, just above, or partly even on, vein 1 of the fore wing filling the interval between the basal yellow marking and the edge of the discal band-spot in interspace 1. This male mark was evidently overlooked in the original description of *mœsoides* by Butler and, subsequently by everybody else who examined the species—if it is that species at all. Certainly Swinhoe overlooked it, as there is no doubt at all that this and no other was examined by him. Both Watson and de Nicéville pronounced it long ago to be *dara* but did not even then notice the male-mark. The above is a very careful description of both sexes of the imago in case it should happen to be something new. In the meantime, on Swinhoe's authority above quoted, notwithstanding the presence of the male glandular mark, it will be called *mœsoides* and this, notwithstanding also, that it is not very exactly the same as the figures of that species in *Lepidoptera Indica,* vol. x, Pl. 815, Figs. 2, *2a, 2b*. The larva and pupa there depicted, figure *2c*, are those of the Kanara insect as far as they go, but as usual, they are bad reproductions of the originals.

Habits.—The egg is laid above or below the leaf of bamboo; the little larva eats the shell, gets to the tip of the leaf and makes a cell by joining the edges, often, at first, for quite a short distance, thus manufacturing a more or less cylindrical (long-conical) house; later on it eats the leaf above the cell, leaving only the midrib by which the cells hang; at the end, pupating inside this; often, though not always, it eats through the midrib so that the cell falls to the ground and pupation takes place there. This cell is strongly closed and thickly clothed or carpeted with silk inside; covered more or less by a white, cereous powdery excretion from the larva as is also the pupa which is not fastened by the tail inside. The cell fits closely to the pupa; its mouth is closed by silks spun across and across with a plentiful supply of white powder. The butterfly is plentiful in the Kanara District both above and below the Ghats, at actual sea level as well as in dense jungle on the hills. It is a very strong, fast flier, likes the shade with sunlight filtering through in patches; plays about for short periods with others, always returning to a chosen seat on the top of a leaf, often near the ground, where it sits with its wings closed over the back. It is hardly ever met with in the open and is not an insect of the Plains. It goes to flowers sparingly but may be seen at bird-droppings, on leaves and, occasionally, at damp spots in the beds of nallas. It basks with the wings slightly opened. The food-plant of the larva is Bamboo of any sort: *Bambusa Oxytenanthera, Dendrocalamus, Teinostachyum.* Swinhoe gives the habitat as India, Burma, Andamans, Ceylon, Hongkong, Malay Peninsula. Under the distribution he says 'A common species throughout India. We have it also from Ceylon and the Andamans; Elwes records it from the Naga Hills, Sikkim and Perak; Watson from the Chin Hills; Doherty from Kumaon; de Rhé Philipe from Misuri and Fergusson from Travancore; J. J. Walker from Hongkong and Moore from Mergui.' He then adds a note stating that Doherty distinguished it from *dara* chiefly by 'the rich, dark, tawny-ochreous colour of the underside, *dara* being greenish-yellow set with dark scales. The markings are almost exactly alike. The prehensores are singularly different; seen from above, the uncus of *dara* is gradually acuminate while that of this is abruptly truncate and slightly bilobed. . . '

In these later days Mr. Ormiston has apparently discovered by renewed study of genitalia that *mœsoides* and *pseudomœsa* are different species—see his paper in the *Report of the Proceedings of the Third Entomological Meeting* held at Pusa, vol. ii, p. 1022. Until now *pseudomœsa* was considered to be synonymous with *mœsoides*. Up to 1898 *dara* included them both.

Swinhoe has treated the above species as a *Padraona.* The genus being distinguished from *Telicota* by very little as shown below, it is here treated as a *Telicota* because the larva is different from that of *Padraona gola* and the pupa is naked, the cell being open; the pupa is rather more like that of *Udaspes, Notocrypta* than like anything known to occur in the *Erynninæ.* It is curious that Swinhoe states that the hind tibiæ in both *Telicota* and *Padraona* are naked. They are not, for they have fringes of hair. The palpi are likewise stated to be laxly scaled on the second joints while the scaling is actually rather dense. These conclusions being, in the present case, based upon an examination of *Telicota augias, bambusæ, mœsoides* and *Padraona gola.* Other species may possibly conform to Swinhoe's specifications.

Genus 26.—PADRAONA.

Imago.—These are all butterflies of the colouring and facies of *Telicota.* Also with similar habits; although, judging by *P. gola,* somewhat weaker in flight and more confined to the ground-vegetation in the hills. None are, probably, insects of the Plains. There are eight species occurring in British India (inclusive of *dara* and *mœsoides* following Swinhoe); these are *dara* (Kollar); *satra,* Swinhoe; *mœsoides* (Butler); *rectifascia* (El. and Edw.); *concinna* (El. and Edw.); *gola* (M.); *otala,* Swinhoe and *nala* (Plöts). The last two are from Burma and the N.W. Himalayas respectively; *concinna, satra* respectively from S. India and Ceylon; *rectifascia* from Sikkim, Burma; the habitat of *gola* is given below; of *dara* is the N.W. Himalayas, Sikkim, Assam and N. Burma and of *mœsoides* as stated above. Besides these there are 24 species enumerated by Swinhoe as occurring in the Indo-Malayan and Chinese countries.

Antennæ.—As in *Telicota* but with the club moderate, not nearly so stout as in that genus, the terminal crook short, pointed.

Palpi.—As in *Telicota.*

Hind tibiæ.—As in *Telicota.*

Fore wing.—As in *Telicota* for vein 12 with the cell shorter, but not much; middle discocellular not so long in proportion to lower; vein 5 from their junction being much less curved from base; vein 3 closer to end of cell, 2 from the middle in both sexes; wing shorter, not nearly so produced apically; costa more arched, outer margin more convex, less oblique.

Hind wing.—Vein 7 a little before end of cell, less than in *Telicota,* the upper margin of cell not curving down at end; vein 2 emitted from close before base of 3.

Egg.—See below under *gola.*

Larva.—See below under *gola.*

Pupa.—See below under *gola.*

Habits.—See below. It is unfortunate that nothing appears to be known of the earlier stages of any species except *gola.*

219. **Padraona gola** (*M.*).—Male.—*Upperside*: very dark-brown with a sligh purplish tint in certain lights; markings dark orange-ochreous, much darker than any of the *dara* group. Fore wing with a streak on basal half close to the costal line, filling interspace 12 completely but leaving bases of vein 12 and upper border of cell unmarked, orange-ochreous with the following orange-ochreous lines and spots:—a thick streak in cell along upper and bottom marginal veins developing into a spot at their ends, these spots however not actually coalescing, the streaks also not reaching base of wing, the lower streak rather undeveloped in the middle allowing the brown ground colour in middle of cell more or less to coalesce with that in base of interspace 2 and so with that in interspace 1; a discal broad, somewhat irregular band from middle of vein 1 to costa joined by a line from base along the upperside of 1 another line or band filling interspace between vein 1 and inner margin, the vein, however, remaining brown; the discal band consists of spots in each interspace 1 to 8; that in 1 occupying the middle third (really less than a third of the length of the whole interspace) with its outer edge excavated, its inner edge only very slightly so; the spot in interspace 2 somewhat longer, situated with its middle at junction of 2 with bottom of cell, its inner edge just before inner end of interspace, its outer end extending slightly further out than outer end of the one under it, also excavated; the spot in 3 occupies the base of the interspace and reaches just to its middle, slightly further than the outer edge of the next lower spot; that in 4 similar but slightly longer outwards, leaving the discocellular of cell brown and connected at its very outer, top corner by a thin chevron-mark with its angle outwards across interspace 5 with the lowest of the three subapical spots, striking it at its lower, outer corner; these three apical spots are quadrate, each excavated triangularly on outer edge, the lowest occupying the middle of interspace 6 and about half as long as the spot in 4; that in 7 dislocated inwards very slightly, about the same length, that in 8 dislocated outwards again and shorter; all this leaves the apex and a broad outer marginal area with the costal interspaces 9 and 10 connected with interspace 5 (except for the orange chevron-mark) all brown as well as a long base in interspace 1 and a short one in 2, the discocellulars and the veins crossing the discal band narrowly. Hind wing with a streak inside cell along the median vein covered by longish, decumbent hairs of the same orange colour; a broad, discal band consisting of quadrate spots in interspaces 1 to 4 and a small, triangular continuation into 5 from the inner, upper end of the uppermost, each spot quadrate, excavated on both sides, the band about as broad as the one on the fore wing and joined to a line along the lower side of vein 1 also covered with longish hairs. *Underside.* Nearly as dark as upperside, saturated richly (the expression is Swinhoe's) with orange-ochreous. Fore wing with the whole base of the wing including the bottom half of cell and everything inside the discal band below and including base of interspace 2, right out to outer margin below the band and beyond it in interspace 1 and the area beneath it and for half the distance to outer margin from the band in 2 and a slight continuation into 3 all black, together with a prominent mark along the discocellulars, the costa from vein 11—end to apex narrowly

and some blurred spots marking the outer borders of the spots of the band in interspaces 6 and 7 and still more slightly in 4. Hind wing is all orange except the whole of interspace 1*a* and the lower half of the next above, 1*b*, outside the discal band and even this is sprinkled with orange scales on the blackish ground; only the discocellular spot is pure-black, an elongated small lunule in the middle of the end of cell; the outer marginal area outside the discal band is marked with round blackish spots in interspaces 2 to 7 blurred owing to the plentiful sprinkling of orange scales; and each spot of the discal band is bordered inside obscurely but brownish; the band itself completely covered evenly with scales and, therefore, lighter and brighter than rest. *Cilia* on upperside of fore wing brown above vein 1 to apex, orange below it; of hind wing all orange; underneath, the fore wing ochreous brown above vein 1, but as on upperside below that vein; on hind wing orange. There are some brown, decumbent, longish hairs on upperside of hind wing in the upper half of cell besides the orange ones in lower half.—Female. Very likely the male in everything except that all the orange markings are smaller. Fore wing *upperside* with the base altogether unmarked except for the spots in the end of the cell—the ends of the streaks; the basal streaks and the costal one are only just indicated by a very sparse sprinkling of orange scales. The hind wing is absolutely like that of the male with the band narrower. *Underside* identical with that of the male except that the bands showing through are narrower beneath in the male and with the underside of club orange, both those being very pale-yellow in the female; palpi brown above, orange beneath in male. Antennæ black above, the shaft banded orange very pale in female; head and thorax above orange and brown mixed in male paler in female; abdomen above black with orange hairs in the male, but hardly any in female; below the colour of chest and abdomen is very pale in the male, nearly white in female; the legs with orange tibiæ and tarsi in male, very pale in the female. Expanse 28 mm. or slightly more occasionally in the female, less for the male.

The above description of the butterflies is from bred specimens in the N. Kanara District of Bombay.

Larva.—The *shape* of the body is circular in transverse section with the ventrum somewhat flattened, thickest in the middle from segment 5 back, thinning to the neck and much more gradually back to the anal segment; the neck with a shining, somewhat swollen collar behind it to the short segment 2; the anal segment longly semicircular, convex transversely, somewhat sloping in dorsal line, overreaching the claspers in a thin flange and fringed all round with very fine, light hairs about 0.15 mm. in length—it is about half the width of the middle of the body; the *head* is slightly longer than a semicircle in shape, the vertex hardly emarginate in dorsal line, the face convex; the surface shining and rather coarsely reticulate-rugose, covered with extremely minute, light, erect, fine, 0.025 mm.—long hairs, these hairs over 0.05 mm. about the mouth-opening; the true clypeus longer than broad, about half the length of face or head, somewhat depressed in dorsal line, the apex very acute; the false clypeus a broad piece outside it of similar shape, reaching more than half way up the face, both plain green and smooth, shining like the head generally; the labrum is transverse, so thin as to be hardly perceptible, longer laterally than in the middle; the ligula also extremely transparent, about the same length as labrum or longer, triangularly emarginate in dorsal line of front margin which is whitish, otherwise colourless; the antennal, basal joint shining green, the 2nd somewhat rusty-soiled; the mandibles very large with the cutting edge entire, yellow with a terminal, dark red-brown edge; the eyes black, numbers 1-4 and 6 forming a semicircular curve, 1 and 2 very close together, 3 and 4 slightly further apart and 6 more than twice as far from 4 as 2 is from 3, number 5 far behind the curve forming a triangle with 4 and 6; the colour of the head is light grass-green with the dorsal line from the hinder margin over vertex to apex of false clypeus somewhat narrowly black, the line splitting there down each side of the false clypeus and forming a black, horse-shoe shaped curve on middle of face, the ends of legs reaching only half way to base of clypeus, also a broader, black band through eyes and up each side of head to meet on the vertex; segment 13 only about one-third the length of segment 12, decreasing in the length laterally on each side; prolegs short, green; true legs shining green. *Surface* of the body dull, covered all over by minute, erect, very fine, white, 0.025 mm. long hairs which are about 0.075 mm. apart; each segment transversely folded with six or seven parallel folds from hinder margin forward for more than half its length; the segments quite distinctly marked. *Spiracles* very small, longly oval, nearly flush, white in colour, those of segments 2 and 12 very much larger. *Colour* is light glaucous-green, sprinkled plentifully with dark-green dots, especially in the spiracular region, the transverse folds often yellowish; a broad, more whitely-glaucous subdorsal band and a lateral, white line the whole length of the body, the actual dorsal line appearing dark-green (the dark-green dots, however, still darker green on it), a dark-green, interrupted line along the bases of prolegs; ventrum darkish-green. L: 16 mm.; B: 3.5 mm.

Pupa.—The *type* is that of the genera *Parnara, Udaspes,* formed naked on the underside of a leaf or blade of grass, the head more or less gently rounded in front outline, the eyes prominent, the frons inclined ventrally, the vertex produced out into a short, upturned, long, conical snout which is as long as the vertex-surface behind it which is again rather large, the hinder margin straight; segment 2 shorter than the head-vertex (without the snout), with both margins straight the dorsal line inclined to the longitudinal axis of pupa at an angle of somewhat over 30° and in the same plane as head-vertex and front slope of thorax; thorax only slightly humped, reaching its highest point just before hinder margin, this being also the highest part of pupa, the hinder margin a semicircular curve with a tendency to the triangular, meeting the wing-line in an open, rounded angle of about 60°, the dorsal line of pupa from thorax-apex backwards gradually sloping to end, the end generally slightly turned up in a light curve from segment 9 or 10; the lateral outline of pupa constricted very slightly at segment 2, the shoulders evenly rounded, the sides parallel from shoulders to segment 8, then gradually converging to the extremity of cremaster; segment 4 of equal length to segment 5, the hinder margin of former curved convexly backwards, that of 5 less so; segment 6 double the length of 5, the hinder margin straight, segments 7, 8 successively very slightly longer, segment 9 shorter again and coequal in length with segments 10, 11, 12; segment 13 a narrow, transverse ring, about one-third the length of segment 12; segment 14 rather longer than 12, deep at base, a thin plate behind, triangular in shape, the end rather broadly rounded, the lateral edges thickened and recurved dorsally leaving the dorsal centre hollowed out longitudinally; the proboscis reaching only just beyond the wings as a short point; the antennæ reaching only half way, pointed, the legs rather shorter, the coxal pieces large, nothing visible between the leg-limits. *Surface* somewhat shining, smooth, without hairs of any sort, segments well-marked. *Spiracles* of segment 2 oval, small, very slightly raised, hardly perceptible, the colour of the pupa; the rest similar, smaller, nearly the colour of the pupa. *Colour* grass-green with indistinct subdorsal and lateral, longitudinal lines the whole length of the body, an interrupted spiracular thread—the tracheæ seen through the integument; the head is lighter, the wings slightly also, the cremaster is whitish. L: 16 mm. over cremaster and snout, 14 mm. otherwise; B: 3.5 mm.

Habits.—The egg is laid on the tip of a grass-blade as a rule, and always single. The little larva makes a cell at the extreme point immediately on emergence, joining the edges of the blade with cross-silks. As it grows it increases the length of this; after reaching the third or fourth stages it lives on the undersides of the blades and just draws the edges loosely together, lying, thus, half exposed as often as not. The pupa is formed on the underside of a blade in such a cell generally formed expressly for the purpose. The larvæ are sluggish creatures but are rarely parasitized, and generally sit with segments 2-4 hunched up, the head lying back. The pupa is attached by the tail and a body-band, and rolls round and round when disturbed. The butterfly inhabits the undergrowth, and its habits are those of the genus *Telicota* for it is a strong flier. It does not, however, ever fly at any height from the ground;

the males bask on the uppersides of leaves with the wings half open, the lower wing more depressed than the upper as often as not; when completely at rest they close the wings completely over the back. The insects frequent flowers, generally such as grown low amongst grasses on the ground. The food-plants of the larva are grasses of various sorts, the softer ones being chosen for preference. Swinhoe gives as the habitat 'Sikkim Assam, S. India, Ceylon, Burma, Andamans, Malay Peninsula and Archipelago'. It is a common species in the Kanara District, both in rice-fields and in the jungles but, in that district, the rice-fields are never any distance from the jungles; indeed, they are generally surrounded by them. It is probably really an insect of jungles and heavy rainfall.

Genus 27.—HALPE.

Imago.—Insects of medium size, brown above and below, the fore wing with three small, subapical, semihyaline spots, generally two more at the end of the cell on the discocellulars, sometimes only one; and a discal series in interspaces 2, 3 and 1, the last occasionally wanting. The upperside of hind wing is immaculate in nearly all species. On the underside the hind wing may have a white or whitish or yellow band with or without darkish spots; or may have a row of darkish or even white (rarely) spots or in a few cases may be washed with yellow with or without dark spots; in these yellow-washed species there is some yellow on the upperside of hind wing too and, occasionally, on the upperside of fore wing. *Halpe* is a large genus, containing twenty-four species in British India and twenty-six more Indo-Malayan, Japanese and Chinese representatives. Swinhoe has divided the genus into two, according as to whether there is a sex-mark in the male or not; calling those that have none *Thoressa* and retaining *Halpe* for the remainder. There are three species of *Thoressa* in British India and one Indo-Malayan. The former are named *astigmata* (Swinhoe); *masoni* (M.) and *honorei,* de Nicéville. The first and last occur in S. India, the other is only found in Burma and Tonkin. In the genus *Halpe* proper two species *moorei,* Watson and *hyrtacus,* de Nicéville are found in the Bombay Presidency and their transformations are given below together with those of *astigmata* and *honorei,* also occurring there. The names of others of the genus in British India are *ceylonica,* M., from S. India, Ceylon, Mergui; *homolea* (Hewits.) from Sikkim through Burma to Java and Sumatra; *sikkima,* M., from Sikkim to Burma; *gupta,* de Nicéville from N.W. Himalayas to Assam and China; *burmana,* Swinh., from Burma; *knyvetti,* El. and Edw., from Sikkim; *zema* (Hewits.) occurring in Sikkim to Burma and in Borneo; *cerata* (Hewits.) in Sikkim, Assam, Burma; *debilis,* El. and Edw., in the Khasia Hills; *fusca,* Elwes in Upper Burma; *decorata,* M., in Ceylon; *sitala,* de Nicéville in the Nilgiris, Anamalais, Ceylon; *brunnea,* M., in Ceylon; *kumara,* de Nicéville in Sikkim, Bhutan; *aina,* de Nicéville in N.W. Himalayas, Sikkim, Assam; *hyrie,* de Nicéville in the Naga Hills, Sikkim, Assam; *evershedi,* Evans in S. India; *albipectus,* de Nicéville in Burma.

Antennæ.—A little more than half the length of the costa of fore wing; club moderate, long with a sharp crook, its tip short, pointed.

Palpi.—Porrect; second joint laxly scaled; third joint minute, obtusely conical.

Hind tibiæ.—Slightly fringed and with two pairs of spurs.

Fore wing.—The male in all except the *Thoressa* section with a linear, discal stigma on the disc running obliquely from the lower end of cell to below vein 1 before its middle; see also below for the hind wing. Vein 12 reaches costa before upper end of cell which (cell) is about two-thirds the length of costa; 6 from upper end of cell, so close that there is no upper discocellular vein; 5 nearer 4 than to 6 because the middle discocellular is nearly twice the length of the lower; the discocellulars in an inwardly-oblique, straight line; 3 from about one-sixth before lower end of cell in the male, in the female its base a little nearer end; 2 beyond the middle; costa arched; apex subacute; outer margin evenly convex, shorter than hinder margin. Hind wing in all except *Thoressa* with a tuft of hair on upperside attached along costal vein; vein 7 from well before upper end of cell, bent upwards at its base in male with the upper margin of cell bent inwards and downwards to cell-end; in female 7 and upper margin of cell are both nearly in a straight line; discocellulars faint; 5 absent; 3 from quite close to lower end; 2 from about an eighth to one-fifth before end; costa and outer margin evenly curved.

Larva.—More or less of ordinary *shape* with the anal end rather broadly rounded, sloping to end; the *head* rather small for larva but of course much broader, higher than the neck, generally yellow but sometimes much suffused with black, rugose as to surface, nearly quite round. *Surface* dullish, the skin thin showing the tracheal tubes through; covered with minute, erect hairs, those round the dorsoventral margin longer; those on anal segment besides, from small, prominent tubercles. *Colour* generally watery green; no longitudinal lines except in *Thoressa honorei* where there is lateral, longitudinal band above which the dorsum is yellowish and underneath which the colour is white, the anal segment being black.

Pupa.—More or less of the same *shape* as that of *Telicota bambusæ* with a slightly convex frons to head and a well-developed, strong cremaster with very distinct extensor-ridges, the suspensory shafts hooked in some species, simple in others, resembling hairs; the spiracle of segment 2 with a very large, ear-shaped or funnel-like expansion behind it. *Surface* covered with fine hairs, not easily visible however except under a lens, those on eyes generally longest—the pupa of *Thoressa honorei* has the hairs so minute as to be difficult to see even with a lens.

Habits.—The butterflies are strong fliers, settling to feed upon flowers but only for a short time, very quick in settling and rising; resting with the wings closed over the back, the front ones rather much drawn down between the hinder; they are fond of shade but fly mostly round the tops of high trees and may occasionally be seen suckling at bird-droppings on leaf-surfaces. They are all perhaps confined to jungle country. The eggs are laid on the underside of leaves as a rule; the larvæ make a cell by joining the edges of the leaf at the point at first and generally through their lives but sometimes double a leaf transversely; they finally close it strongly at both ends as well and cut it free so that it falls to the ground. All the pupæ have a covering of cereous, white powder which is excreted by the larva and gets all over the inside of the cell. Most of the larvæ occasionally lie over in the cell for several months in the dry season; then pupate and the butterfly comes out in the normal ten days or so. The food plant of all the caterpillars known is Bamboo of any kind.

220. **Halpe moorei,** *Watson.*—Male. *Upperside*: blackish-brown when fresh with a purplish gloss or bloom in certain lights; fading paler. Fore wing with seven hyaline-white spots: three small, subapical in interspaces 6, 7, 8, the first two near the bases of the interspaces, the uppermost about the middle; two spots in the cell, one above the other in a line with the sex-mark; two larger, sub-quadrate in interspaces 2, 3, the lower the larger slightly, the upper with its inner edge in a line with outer edge of the other, both a bit outwards from bases of their interspaces; the costal space up to half way out, interspace 1 from base to the stigma and the inner-marginal interspace half way out covered with golden-yellowish, decumbent hairs; the stigma itself black, swollen. Hind wing unmarked except for an obscure paleness about the inner half of the interspaces 4 and 5 which may spread downwards into interspaces 2 and 3 slightly and upwards into 6; the lower half of cell and this paleness with decumbent, longish, pale-yellow hairs; the upper half of cell with a tuft of blackish hairs producing a distinct blackish appearance; a ridge of longer, only semidecumbent hairs along vein 1*b* from base to outer margin. *Underside* paler; brown. Fore wing with the semihyaline spots showing through; a sprinkling of pale-yellow scales along the costa above vein 12 and to apex and thence somewhat narrowly down to vein 2 along

outer margin with small, blurred-whitish submarginal spots in interspaces 2 to 7, one in the middle of each. Hind wing with a conspicuous white band along and including vein 1*b* expanding generally downwards at end more than half way to anal angle and from this arises, just about half way towards the outer margin, a broad, conspicuous, white band that runs across the whole wing to the outer margin just below the end of vein 8; this band being made up of a large, quadrate, white spot in interspace 1*b* about 1.5 mm. long, the inner edge straight and immediately below junction of vein 2 with the cell, its outer edge slightly emarginate; followed by a much narrower one in the base of interspace 2, its outer edge in a line with outer edge of the other; a third nearly filling the whole of the basal half of interspaces 4, 5; a fourth above, more or less oval, little more than half the size of the third (which is the largest of all), its inner edge in a line with outer edge of third in interspace 6 and, finally, a small, blurred one in interspace 8 situated just about over the middle of the fourth; every spot divided from the others by the brown veins—the very extreme base of interspace 3 may also have a few white scales in it; the base, costa and along outer margin have a sprinkling of pale-yellow scales and there is just an indication of a small, white spot, submarignally in interspaces 2, 3 and 4 with, always, a larger one amounting to a little patch in interspace 1*b* that may be joined by a line with the end of the white streak along vein 1*b;* a few light-yellow, decumbent, long hairs in the cell. *Cilia* of fore wing above and below brown with tiny white intervals in middle of each interspace, the interspace 1 pure white; hind wing with them checkered white and brown equally and with the bases brown. There is very little sign of a fringe of hair along inner margin of fore wing. Antennæ black, the shaft with the edges of joints thinly white below and the club white below from very base to half way towards tip and up along the sides of the dull-orange upper half; palpi brown on top, pale ochreous below and set with black, short, bristle-like hairs, the third joint all brown surrounded completely at base by pale-ochreous; head brown mixed with grey; thorax brown with yellow and greyish hairs and a greenish sheen; abdomen brown with grey segmental bands at edges of segments; beneath, the chest pale-ochreous with great jet-black patches on the coxae, the tibiae and tarsi light-orange; abdomen below also brown but the segmental bands very broadly whitish-ochreous.—Female like the male but with an extra white spot of small size in the middle of and just above vein 1 of fore wing; the outer edges of the large discal pair of spots always excavated. Expanse 30-35 mm.

Larva.—The body is of the *shape* of that of *Telicota bambusæ* or any of the genus *Halpe;* the head about as broad as segment 3; segment 13 convex backwards, becoming shorter towards the sides, not quite half as long as segment 12 and rather higher at its posterior margin than the front surface of anal segment; this latter about as long as segment 12, rounded at end broadly—an elongated semicircle in shape; a distinct neck, the prolegs and legs short; the body flattest in the middle but very much the same breadth really from segment 3 to segment 12; the *head* rather higher than broad, otherwise rounded, thick, the surface finely honeycombed—roughened with a clothing of extremely short, fine, light, erect hairs, longer about the mouth-opening and eye-regions; the clypeus about one-third the height of the face, longly triangular, the apex acute; the false clypeus outside it forming a narrow band all round, also triangular, about half the height of face or less, a slight raised dorsal ridge up the middle or the former; the labrum transverse, narrow, parallel-sided, brown-red in colour; the ligula pear-shaped the narrow side forming the base or stalk, also red-brown, shining as is the labrum; the antennal, basal as well as second joints light red-brown, shining; the mandibles also rusty with narrow black borders and without teeth; the eyes, four in a very gentle curve, equally spaced, the fifth well behind forming an equilateral triangle with sixth and fourth, also red-brownish. The *surface* dull, covered with extremely minute, erect, fine, light hairs which are much longer subspiracularly and still longer again on the anal margin and dorsum of the anal segment where each hair rises from a prominent, though still small (prominent under a strong glass), conical, rusty tubercle—the dorsum of 14 covered with these tubercles; the hinder margins of segments have the front margins of the succeeding segments telescoped into them and the surface of the segment just before the hinder margin is crossed by transverse, depressed lines forming four folds or interspaces parallel to each other and to the hinder and front margins; some folding in spiracular region; *Spiracles* small, convex, broadly oval, very light yellow-brown or brownish-yellow, those of segment 2 much larger, those of segment 12 nearly twice as large but smaller than those of segment 2. *Colour* greenish with a slight rusty tinge especially dorsally; the male organs on dorsum of segment 10 very conspicuous, orange; the tracheæ slightly visible subcutaneously; the colour of the head is soiled very light orange with a broad, dorsal, dark shade from hinder margin over vertex to apex of clypeus, this shade being sometimes a broad, brown-red band which splits thinly down each side of the clypeus; the eyes are dark, the four in a curve placed on a light red-brown patch that is not extensive. L: 25 mm.; B: 3.5 mm. (not quite full-fed).

Pupa.—The pupa, too, is much the same shape as that of *Telicota bambusæ* in every way: it has the same sort of spiracular expansions to segment 2; the colour is also the same; the body is widest at the thorax; there is a slight, light lateral constriction at segment 2 behind the rather prominent eyes, the vertex of *head* is long and inclined at an angle of somewhere near 45° to the longitudinal axis of the pupa, the frons is perpendicular to that axis, rounded, short and prominent though only lightly so, convex; segment 2 is in the same plane as the vertex of head, short, only about one-third the length of the vertex of head and the margins are parallel, straight and quite flush with dorsal surface; the front slope of thorax is between 45° and 60° to the longitudinal axis of the pupa, short, the general surface of thorax even, lowly convex, the dorsal portion after the short frontal slope gradually ascending to the hinder margin, the whole dorsal line of pupa from about the front third of thorax to segment 9 being parallel to the longitudinal axis; the hinder margin of thorax is more or less a low, broad triangle, the apex of which, however, is narrowly rounded and it meets the wing-line on each side in an angle of between 60° and 90° which angle is rounded, broad and shallow, segment 2 is about one-fourth as long as thorax, the hinder margin curved convexly backwards and is equal in length to segment 5 whose hinder margin is also curved backwards but the curve is not nearly so convex (backwards); segment 6 is a good deal longer than 5 and equal to the succeeding segments up to 12; segment 13 is very short and the dorsal slope, with that of segments 11 and part of 10 and segment 14, is inclined at at angle of about 30° or less to the longitudinal axis of pupa; segment 14 is about equal in length to segment 12 but is, of course, narrower at the front margin, still narrower at the hinder margin—it is trapeze-shaped—thinning from the deep base at segment 13 backwards to a thin edge at extremity where the corners are produced out sideways into short, conical teeth, one to each, the edge between these teeth being concave forwards, the dorsal surface also has a fairly deep, gradual depression in the dorsal line and there is no sign of extensor ridges either dorsally or ventrally; the transverse section of the body is more or less circular from thorax to segment 13; the proboscis is not produced in any way beyond the wings and the antennæ reach to about two-thirds the length of wings from their bases. *Surface* of pupa is slightly shining and nearly smooth though somewhat granulated-looking, the segment margins are all distinct, those of segments 8-12 very slightly raised (the hinder margins), all of them have a narrow, quite smooth band along hinder margin; the whole surface covered with comparatively long, soft, decumbent, light hairs; longer, erect, golden reddish hairs which cover, in a tufty way, the sides of eyes and the frontal boss and the softer hairs are rather longer than usual and more erect on the front slope of thorax dorsally; the cremastral edge is set with the longest, golden-reddish hairs of any, sticking out backwards, straight along the sides as well as between the teeth and the hairs generally on segment 14 are longer than elsewhere. *Spiracles* of segment 2 are distinguished by large expansions which are semicircular, only very slightly raised from the general surface of segment 3 upon which they lie, straight edge being along the common margin of segments 2 and 3, the length slightly longer (the length being taken in the sense transverse to pupal length in this case) than segment 2 in dorsal line, the surface of the semicircle sloping down from the raised edges forwards to a deep slightly excentric depression or hole placed nearer the outside (next the antenna) edge of the semicircle than to the inside; this depression or hole is transparent-looking, light yellowish-green while the expansion semicircle containing it is dark red-brown so that it is very conspicuous and, being placed up against the front margin of segment 3, that is against the diameter of the semi-circle, produces the appearance of a low or short horse-shoe of which the upper leg (the one nearest dorsal line of pupa) is thicker than the lower, the curve of the horse-shoe being thinnest as the hole is comparatively rather large; the two ends of the horse-shoe where they impinge on the segment margin are somewhat thickened also; the other spiracles are small, oval, slightly raised, rather light red-brown or yellowish; above each spiracle or in a corresponding position, dorsolateral therefore, is, on each segment, much nearer the hinder margin than the front margin, a small, oval, flat, shining tubercle which is red-brown in colour also. *Colour* of pupa that of a fresh bone, the wings, thorax, segment 2 and head somewhat translucent or watery looking; the cremaster shining, bright brown-reddish, at least at the extremity; later on these parts become darker; there is always a greenish, dorsal, subcutaneous line. L: 17 mm.; B: 4 mm.

Habits.—The young egg larva makes a cell at the point of a leaf by joining the edges, and this method is continued up to the end by joining longer lengths of edges, a new leaf being chosen whenever necessary; it feeds at first upon the leaf just in front of the cell entrance—which is of course always towards the base of the leaf—but later on, when grown larger, from the second stage onwards, perhaps, goes out to feed on other leaves close by. The cell is always fairly tight for the body of the larva, but is invariably of much greater length and circular in section; it is invariably lined inside thickly with silk, sometimes evenly, sometimes in steps. When about to pupate, the larva makes the cell some way away from the tip of the leaf—that is, the tip is not included—by eating a line from edge inwards on one side to midrib and another about 30 mm. further away, towards the leaf-base, also in from the edge to mid-rib and turns over the piece thus freed at both ends on to the opposite upper surface of leaf, fastens the edge down and, after shaping the two ends irregularly, also fastens them down; clothes the inside densely or thickly with silk, evenly and in steps, settles down and, after two or three days, changes into a pupa; this pupa is often lightly covered with a cereous excretion which is visible between the two front pairs (sometimes between all) of prolegs on the sides of the larva prior to settling down. The butterfly is a very strong flier and rises often high into the air; is not much seen except at the tops of hills where the trees are low and accessible (their crowns). There males come and bask on the tops of leaves, sitting with their wings closed over the back, motionless, the antennæ directed well out forwards, apparently in an attitude of expectancy. They dart at anything of their own species that comes along, and go off into the air in pursuit. They, however, nearly invariably return to the same perch time after time. Here at the hill-tops, they make their appearance about 9 a.m. and stay until about 11 when they apparently go somewhere else, may be to feed. They do not go much to flowers but may be seen sucking at bird-droppings on leaves occasionally. Their visits to hill-tops must be made in quest of females; out of a couple of dozen butterflies caught in some successive days, not a single one was female. The latter sex apparently does not bask and is not easily got. In breeding however as many males as females emerge so there is no real discrepancy in numbers. The little egg-larva emerges through the top of the egg, leaving a round lid and sometimes eats the shell but sometimes does not; the egg is laid on the underside of a leaf; the little larva is honey-coloured, very pale and has a round, quite black head. The final cell is cut free from the plant or rest of the leaf (when the leaves are too large to be wholly employed as in *Ochlandra talboti,* Brandis) and falls to the ground where pupation takes place within it. The butterfly is an insect of jungles and, probably, fairly heavy to very heavy rainfall, and is plentiful in the Kanara District from the sea-shore up to 3,000 feet, the highest point of the Ghats within those limits.

In one description of the pupa made, it is noticed that there is 'a small, flat, shining, oval disc-like tubercle laterally on segments 2 to 12 as well as three under spiracles of segments 10, 12, two on 8, 9, 11, dark-brown in colour' and further that the cremaster is 'trapeze-shaped, short, broader than long, about as long as 13, its distal extremity the shorter, the lateral sides shortest with a dorsolateral tooth or short point directed out and upwards at end of each or immediately before the end; the dorsal extensor-ridges very short, the ventral ones nearly wanting altogether'. The head is sometimes much more suffused and, often, has a crescent-shaped blackish mark in the middle of face of each lobe, sometimes connected to the dorsal band at apex of clypeus.

Swinhoe gives the habitat of *Halpe moorei* as India, Burma, Ceylon, Hongkong. Under 'Distribution' he says, 'Watson records it from the Chin Hills, Rangoon, Berhampur and the Andamans; de Rhé-Philipe from Misuri; J. J. Walker from Hongkong; de Nicéville from Sikkim; Elwes from Trichinopoly in Ceylon and Tavoy in Burma; Moore from Calcutta; we have received many examples from the Khasia Hills and have it from Port Blair in the Andamans, Calcutta, Ranikhot, Karwar in N. Kanara; Davidson, Bell and Aitken bred it at Karwar; our figures of the larva and pupa are from Davidson's original drawing not previuosly published. Adamson says it is a common species in Burma.'

The figures above referred to are contained on Plate 817 of *Lepidoptera Indica,* Fig. 1*c*. The butterflies are also figured, 1 being the male upperside, 1*a* the female and 1*b* the underside—the stigma on the male is not indicated at all and the colour is not nearly black enough. Neither the representations of the butterfly or the larva and pupa are good.

221. **Halpe hyrtacus,** *de Nicéville.*—Male. *Upperside* dark-brown, the area above vein 12 of fore wing along costa sparsely sprinkled with yellow scales and the basal half of cell sparsely set with golden, decumbent hairs; there are a few scales towards apex on the costa. Fore wing with six very small, white, semihyaline spots, or seven; two in the cell, the upper against the upper margin at the origin of vein 9, the larger as a rule, the other in the very outer, lower corner, much smaller and often absent; three subapical, occasionally very tiny dots in interspaces 6, 7, 8, that in 6 near the base of the interspace, that in 7 moved very slightly inwards, that in 8 about the middle of its interspace and the uppermost may be absent in some specimens; a spot, the largest—but still small—in the very base of interspace 2 with another, very slightly smaller and a bit further out in 3. The brand on the disc dark, consisting of three parts, the uppermost circular in the very base of interspace 2, the other two crescent-shaped, the hollow inwards, the two

in a line filling the interval between veins 1 and 2 from the end of cell to the middle of vein 1 or slightly further out; this brand with each section tumid, the crescent-shaped parts naked and shining. There is a very slight hair-fringe along inner margin. Hind wing quite immaculate with darker, short hair occupying top half of cell, longer, decumbent, yellowish hairs in the bottom half stretching outwards to about three-quarters the way to outer margin below vein 3 followed by brown hair in interspace 1*b* and dense, long, brown hairs in a thick ridge all along 1*b* to anal angle. *Underside*: much paler than upper side. Fore wing with the spots as on upperside and the whole base below the cell and out to a line joining the upper end of the stigma (therefore lower, outer end of cell) to the tornal angle pure-white or nearly so; pale, blurred, whitish spots in interspaces 4, 5, 6 and 7 submarginal with obscure darkish lunules bordering their outer edges. Hind wing with the whole base except above vein 8 and base of interspace 7 white out to the middle, extending a little more outwards in interspace 1*a* and the lower half of 1*b*, white with a spot of ground colour under the junction of vein 2 with cell, another at the junction of 6 with cell and a third under the middle of vein 8; some yellow scales on the brown, costal area above vein 8; some few white scales making obscure spots, postdiscal, in interspaces 3, 4, 5; there are some white, decumbent hairs in the cell from base to its end.—Female like the male in everything except that the semi hyaline spots are always larger, the stigma is absent on the fore wing upperside; and the whole colour is paler. *Cilia* dark-brown at base and very little paler beyond. Antennæ with the top bent sharply at right angles and rather long, longer than the width of club; black above with the tip of club grey; beneath, the upper part of shaft and club are yellow, the apiculus dark brown-red. Palpi above black and yellow mixed, the third joint brown and somewhat porrect, not hidden by the hairs; below light-ochreous. Head, thorax and abdomen more or less concolourous with wings above; below, the pectus pale-ochreous in middle, whitish at sides, the abdomen grey with last segment brown; legs slightly ferruginous. Expanse 40 mm.; the female slightly larger than the male.

Larva.—Is of a more or less ordinary skipper *shape*: more or less cylindrical, the ventrum of course, however, depressed or flattened; the prolegs and true legs short; the anal segment sloping at about 60° to the longitudinal axis of the body, semicircular in shape, convex transversely as well as very slightly longitudinally, the whole surface of anal segment except the extreme anterior margin covered with small, star-shaped, black or deep red-brown tubercles from each of which rises a soft, short, light greyish hair: the ground-colour on which these tubercles are situated is greyish, different from the rest of the larva; the neck is slightly tumid owing to the presence of a somewhat thickened, light-yellowish collar from spiracle to spiracle; the *head* is large, somewhat oval in shape, higher than broad, the medial (dorsal) line very slightly depressed on vertex, continued down as far as apex of clypeus, the lower face, from just about the level of the true clypeus down, being slightly flattened and inclined at an angle to the upper part; the true clypeus reaches about one-third or slightly more up the face; the false clypeus about half way and both are triangular in shape with the apex acute, the surface somewhat lugose; the labrum is small and membranous; the ligula rather large, deeply emarginate and trapeze-shaped, the outer or emarginate side being the longest; the whole shining red-brown; the mandibles are large, shining, dark red-brown; the eyes are black, four in a short curve, the other two difficult to see; the surface is rugose-cellular, rather strongly so, and is covered with a clothing of erect, fine, soft, greyish hairs that are best seen against the light sideways: they are not short,—needless to say the head is much broader and higher than segment 2; the colour is dark brown or nearly black, somewhat shining, this black being confined to the whole of the hinder part of the head, thence over vertex in a broad dorsal band down to include the clypeus and the lower parts of face leaving the middle of each lobe-face soiled lightish yellow with a triangular point of brownish—a sort of flush from the black—coming up into its basal part parallel to the dorsal line for a short distance; there is a similar point coming out from the broad, dorsal line about half way between apex of clypeus and vertex which is directed diagonally out and upwards. *Surface* of larva dull, more or less smooth except for some very short, erect, minute, light hairs which are sparsely disposed over the dorsal parts above the spiracular line; there are some much longer hairs in the dorso-ventral region and along anal posterior margin as well as ventrally, these longer hairs like those on the head : soft, light, more or less erect; each segment has a series of depressed, thin lines, parallel to hinder margin and nearer to it than to front margin : there are five of these, the first two much further apart than the others; then there are the small, hair-bearing tubercles on segment 14 mentioned above; segment 13 is very short. *Spiracles* not very small, light yellowish, rather longly oval, nearly flush; those of segment 2 very much larger, those of segment 12 not so large as those of segment 2 but considerably larger than rest. *Colour* of the larva is a very soiled-looking somewhat watery olive-green, with the ventrum green and the anal segment dorsally greyish; segment 2 yellowish. L : over 25 mm.; B : 3.5 mm. when not quite full-fed.

Pupa.—A stout pupa of the *shape* of *Telicota bambusæ;* thorax stout and the *head* transverse, bowed, the frons high, in a plane at right angles to longitudinal axis of the pupa, slightly convex, the vertex at an angle of 45° or more, broad between the bases of antennæ, the hinder margin straight, the eyes large, the outline in front of head square, slightly convexly rounded, the labrum a small, trapezoidal piece between the bases of proboscis, the ligula a small, very acute drop-shaped piece contiguous to it in front : this labrum and ligula ventral of course; segment 2 a short piece in the same dorsal plane as vertex of head, its hinder margin straight, laterally cut away to receive the spiracles and there very thinly raised over the opening of spiracle; thorax at apex the highest part of pupa, the front slope for half its length in the same plane as segment 2 and head-vertex, then curving round gradually to become more or less parallel to the longitudinal axis of pupa, then slightly inclined towards segment 4 which rises towards it and forms its even hinder slope-end, the hinder margin a parabolic curve rather narrowed in the pole, that meets the wings in a widely open, rounded, rather deep angle of 45°; segment 4 is as long as segment 5 in the dorsal line; segment 6 is one-third longer than either; segment 12 is shorter than 11; segment 13 is just represented as a base to the cremastral segment, very short; bevilled margins of segments 8-11 hardly noticeably developed; cremasteral segment longly triangular though truncated at extremity, the dorsal extensor ridges thin, distinctly raised, the area between them nearly flat, the sides of cremaster (lateral faces) also triangular with a large, oval, shallow hollow bordered by a raised line or thin ridge at the ventral base under segment 13 or on the outer face of the anal claspers (represented ventrally by the scars) and *this large hollow or oval is characteristic,* the ventral extremity of cremaster hollowed out considerably, the suspensory hooklets small, bunched at the very extremity and slightly dorsally; the proboscis is not produced at all beyond wings; the body is of equal width from the evenly rounded shoulders to segment 6, the pupa is constricted slightly just behind eyes, the head nearly as broad as shoulders, the body from segment 6 thinning to cremaster gradually, the dorsal line thence to cremaster slightly convex, the ventral line straight. *Surface* of pupa moderately dull, transversely finely rayed with minutely waved, raised lines, the segment margins well enough marked, the extreme hinder margins of each segment narrowly smooth on segments 8 to 10; the whole pupa covered with a soft, more or less decumbent, short, light down which is longer and more erected in the spiracular regions and much longer and nearly erect on the head-frons, the front and posterior surfaces of eyes and along the sides of the cremaster; there is, besides, a very small, flattened, red-brown, chitinized disc subdorsally near the hinder margin of each segment and a subdorsal, depressed point on segment 2. *Spiracles* of segment 2 with an ear-shaped, deep-brown, rugose expansion on segment 3 front margin consisting of a slightly raised semicircular boundary behind, the whole surface sloping downwards from that boundary to the front margin of the segment and ending in a hole in its spiracular region under the thinly raised hinder margin of segment 2 alluded to above : this dark brown, rugose surface quite 2 mm. in breadth by over 1 mm. in length (dimensions corresponding with length and breadth of pupa); other spiracles rather small, narrowly oblong, raised, yellowish. *Colour* of the pupa that of a soiled fresh bone, the wings greenish, the cremastral extensor ridges and borders of the hollow red-brown; boss of head or frons and dorsal portion of thorax sullied with brown, the latter having it disposed in subdorsal bands; abdominal segment with two, parallel, transverse rows of brown dots reaching down to lateral line and a postspiracular and some subspiracular ones. L : 20 mm. ; B : 5 mm.

Habits.—This species was first caught amongst the hills in big jungle at a place in the N. Kanara District of the Bombay Presidency called Tarimallapur, an uninhabited village-site up the Kalinaddi river, forty miles from the coast. Shortly afterwards a larva was obtained at the same place, in the year 1895, on the large-leafed bamboo, *Ochlandra talboti,* Brandis, that grows in damp, even swampy places by nallas in the valleys. Many years afterwards specimens were sent to de Nicéville in Calcutta who said that he had just named it from two ragged specimens received from Tranvancore. Subsequently to the first discovery, a few years afterwards, more larvæ were obtained at another place on the crest of the Western Ghats in the same district, called Anshi; and on the same species of bamboo; and, since then too, it has been occasionally found at this last place when looking for caterpillars of *Halpe astigmata;* at least it would be more correct to say that, when looking for caterpillars of *hyrtacus,* those of *astigmata* were found and collected thinking they were the other. It is a rare species and, like *astigmata,* is hardly ever seen in the perfect state, flying. The butterfly has been seen thrice and *astigmata* once. Many caterpillars have occasionally been obtained when a violent effort was made; but the habit they have of lying over for months during the cold weather has prevented breeding any number of perfect insects. The best time for collecting is during the very heavy rains in August when it is difficult to get about. No carts can be had, the river is in flood, roads are impassable because unbridged; the bungalows are very damp and uncomfortable. Besides which the place where the larvæ have to be sought is swarming with leeches. The habits of the larva are those of *Telicota bambusæ* as far as the cell-making is concerned; it is just as sluggish or even more so in its movements. It does not appear to excrete any cereous, white powder in the cell but probably cuts the cell away from the leaf when about to pupate. The pupa is firmly attached by the tail inside. The habitat is the Western Ghats from Kanara to Travancore.

Another note about the larva is to the effect that the 'anal segment is covered with minute, star-shaped, low tubercles of a red-brown colour from each of which springs a short, erect hair'.

222. **Halpe (Thoressa) astigmata** (*Swinh.*) :—Male. *Upperside* blackish-brown. Fore wing with the basal portion as far out as to half the length of cell and the whole of the inner-marginal space below vein 1 to outer margin set with golden-yellow hairs, sparsely except along the inner margin ; and with six semihyaline spots, two subapical towards the bases of interspaces 6, 7, the lower slightly the larger and two discal, the upper towards the base of interspace 3, somewhat larger still, the fourth underneath, further in, just before the junction of vein 3 with end of cell, in interspace 2 largest, oblong but only slightly longer than broad, its edges straight, just 1 mm. broad ; and two in the cell, coalescing in a point on the middle line of cell and situate so that the lower border of the lower one takes up a length of the bottom vein of cell extending from close to the outer, lower corner of cell as far in as the base of vein 2 where it joins the bottom vein, both these cell-spots about equal in size, smaller than the discal one in interspace 2 but larger than any of the others. There is only a slight fringe of hairs along the inner

margin. Hind wing: the lower half of cell extending outwards thence half way to outer margin covered sparsely with golden-yellow, decumbent, longish hairs; much denser, brown, longer hairs all along vein 1*b* from base to outer margin; but without markings. *Underside* paler than above because it is sprinkled all over sparcely by small, yellow scales all over the hind wing and along costa and the apex down to tornal angle in a narrowing band. Fore wing with spots as above and a very indistinct series of pale submarginal spots in interspaces 3 to 7; interspaces 4, 5 often pale at base and 1 and inner-marginal space pale at outer ends. Hind wing with a pure-white spot of scales in the middle of interspace 7 and at its base, the latter the larger (but rather small at that) and one beyond the middle of interspace 6 followed by very small ones in 5, 4, 3 somewhat further out and in a straight line with finally one in the very middle of 2; a pale streak along the upperside of vein 1*b* from base to half way out with a pale patch in interspace 1*b* before the margin. There are some shortish, yellow, decumbent hairs in cell and outwards below it and extending a bit beyond its end. Antennæ black above, the shaft black below too; the club with just the end ochreous as well as the whole of the underside, the apiculus brownish-red and this colour extending some way down the underside of club. Palpi brown above with some ochreous hairs, dull ochreous below because of a mixture of black hairs. Head brown; the brown with a greenish sheen; abdomen dark-brown with some yellow scales. Below, the pectus ochreous, the legs ferruginous, all pale; abdomen dark but with broad, pale-ochreous segmental hands.—Female like the male but somewhat paler; the spots no larger. *Cilia* on fore wing ashy-brown slightly paler at apex and more extensively above tornal angle; on hind wing all very pale throughout. Expanse 35 mm. for female; the male a bit smaller.

Larva.—Is of the ordinary *shape*, fattest in the middle, fining gently to both ends; the anal end rather longly semicircular, dorsally sloping in segment 14 at about 30°, the extremity slightly overreaching the anal claspers; segment 13 rather less than half 12 in length; 14 about as long as 12, segment 11 somewhat longer than 12; legs short; *head* rather small, broadly elliptical with the vertex broadly rounded and very slightly indented in dorsal line and depressed as far as the top of clypeus, the bottom of depression angular; the surface cellular-rough, the roughness somewhat accentuated and prominent on vertex, clothed besides with semi-decumbent, short, somewhat sparse, light hairs all over, these hairs somewhat longer about base of lobes and mouth-opening; true clypeus triangular, much longer than broad, apex very acute, reaching about two-fifths the way up face, with irregular ridges down its surface; the false clypeus reaching about half-way up face, narrow beyond the true clypeus, the strip on each side increasing in width from base to apex but fairly narrow even at apex, triangular with the apex acute; the labrum dark-brown like the head, transverse, rather short; the antennal joints both shining, whitish-soiled; the mandibles large and strong with the cutting edge toothless, quite even, the colour of head; the ligula the same colour too, rather large, circular fringed with sparse, fine, reddish hairs, with a rather large, rounded sinus in dorsal line on the front margin; eyes dark, the topmost much smaller than the next three lower, the colour very dark red-brown with a light, broad, subdorsal area on face; the fifth and sixth also very small; *Spiracles* of moderate size, those of segments 2 and 12 rather larger, all flush and yellowish or extremely light-brown, broadly oval. *Surface* dull, the segments quite distinct, covered all over with minute, erect, very light-coloured, numerous hairs which are very much longer round the anal margin where, also, they are reddish on the dorsal part. *Colour* light-green with a dorsal, darker, pulsating line. L: 25 mm.; B: 4.5.

Pupa.—Is more or less cylindrical in *shape* from the smoothly and evenly rounded shoulders to segment 9 after which it gradually fines down, the transverse section always a circle, until it reaches the hinder margin of segment 12; segment 13 is not apparent at all dorsally but is as a short band ventrally, the three segments 13-14 forming a conical piece, mostly slightly longer than broad at the base, ending, viewed dorsally, in a moderately broadly truncated extremity, this extremity being the cremastral portion, most of segment 14, flattened on top with fairly strong dorsal extensor-ridges limiting it laterally leaving the middle part sunken, the very extremity hollowed out ventrally and slightly bent down, each corner produced into a strong, chitinized, sharp, conical, short point about half as long as the distance separating their bases, this distance slightly concave backwards, the edges of the whole piece as far back as segment 13 and between the points fringed densely with hairs which are twice or three times as long as the little teeth and stick out horizontally all round; segment 13 half as long as cremaster or segment 12 which are coequal (by the cremaster is meant the hard, flattened, chitinized end piece of chrysalis); segment 12 slightly shorter than 11; the thorax is twice as long as segment 8 including the bevilled margins of this latter segment, its dorsal line is mostly parallel to the longitudinal axis of pupa, ascending towards it from the straight front margin, descending from it to segment 4 in the posterior part, the hinder margin is a broad quarter-circle curve meeting the wings in a moderately deep, broadly rounded angle of about 70° ; segments 4 and 5 are coequal, about half segment 6 in length, segment 6 and segment 7 are again coequal; segment 8 is slightly longer; the *head* has the clypeus nearly ventral, rounded upwards and narrowed towards the base next the proboscis, the frons is in a plane perpendicular to the longitudinal axis of the pupa, much swollen convexly between the eyes, the vertex is inclined at an angle of 30° to the axis and is dorsal and broad—the whole head is broadly square in front of the shoulders—with a straight hinder margin; segment 2 is a transverse strip with parallel margins about the length of segment 5 and is hardly narrowed towards the spiracles; the proboscis reaches the ends of the wings but the antennæ only reach about two-thirds or three-quarters the way down, the midlegs ending between these two—the proboscis is *not* in any way free beyond the wings. *Surface* of pupa hardly shining, covered with a fine, short, reddish down which is decumbent and not nearly dense enough to constitute a pile; the abdomen being extremely minutely punctate rather closely, the thorax, segments 2 and head extremely finely aciculated transversely and irregularly. *Spiracles* of segment 2 are little perforations situated at the common margin of segments 2 and 3 and form the somewhat laterally excentric centre of a very shallow half-funnel formed by a slightly raised, red-brown semicircular surface lying on segment 3, a large semicircle with its height equal in length to the length of segment 2 and its breadth along the common margin twice that; the other spiracles are rather large, prominent, oval, with depressed, central slits, light brownish-yellow in colour. By the way, above and beneath each spiracle, slightly in front of it there is a small, oval, shining spot, very slightly raised from the surface and the abdomen is finely transversely shallowly aciculate as well as punctate, *Colour* is a soiled bone-colour with the cremastral portion red-brown and shining. L : 22 mm. ; B : 6 mm.

Habits.—The habits of the larva consist in forming, at first, a cell by sewing together the edges at the tip of the leaf or blade; indeed this habit is continued right up to the end except that, at the end, when the larva is fully grown, it eats a great deal more of course and, always eating the blade on which the cell is formed, it finishes up by having the portion it lives in towards the tip hanging to the basal portion by just the midrib; it changes blades as required during this last stage. Finally, to pupate, it proceeds to turn the leaf over at right angles to the midrib, bringing the tip down towards the base, then eating both laminæ through to the midrib about a couple of inches from where it is doubled; it fastens the edges of the oblong piece thus formed together with web, rounding off the open end and, finally cuts through the midrib also so that the cell falls to the ground—much in the manner of *Halpe moorei* or *Plastingia submaculata.* It generally has been found close to the beds of nallas in the monsoon months and, sometimes, the cell falls into water; it mostly, indeed, gets washed down the hill-sides and gets swamped away down stream until caught up between stones at the side or it gets caught up before reaching the stream. The larvæ often make two or three attempts at a cell before finishing off a final one. This cell is lined inside with silk and especially at the open end there is a dense covering or lax closure of feathery, cereous matter mixed in with the silks which makes a very effective bar to any water getting in. The pupa is not attached inside the cell and is generally—always—placed with its head *away* from the open end. The imago is rarely seen and is an insect of the damp, heavy rainfall ghat portions of the Western Ghats in Kanara. It flies fast, is fond of sitting on the ends of leaves high up, basking, and is very difficult to catch. The foodplant is *Ochlandra talboti,* Brandis.

Swinhoe pictures the species on Plate 822 in *Lepidoptera Indica* Figures 4 male and 4*a* female, 4*b* the underside, and says that it has been obtained in the Nilgiris, the type being in the B.M. from there. It was, it is believed, collected by Sir George Hampson; he says that he has it in his collection from the same locality and that Davidson, Bell and Aitken record it from Karwar. N. Kanara would be more correct because the insect was never seen in Karwar itself on the very sea shore. It came from Anshi on the crest of the Western Ghats at about 1,500 feet in the evergreen areas where the rainfall must be at least 200 inches in the year if not more. The first specimen seen was caught there with a net in the year 1895 and it has not been seen flying again. It was caught in the same nalla in which afterwards the larva was obtained, curiously enough. It is of course an insect of powerful flight but little or nothing is known otherwise of its habits.

223. **Halpe (Thoressa) honorei,** *de Nicéville.*—Male. *Upperside* : brown with an ochreous tint; spots dark orange-ochreous. Fore wing with the basal half covered with short, ochreous hairs in the interspaces and the following semihyaline markings :—2 mm. long spot in the cell with its outer edge just at middle of wing and filling the cell up to and down to its borders, quadrate or constricted into a neck of varying thickness in the middle along the fold in cell; a discal one in interspace 2, its inner edge below outer edge of cell-spot, about twice the length or somewhat less with another above it in interspace 3 that is half the length of it (equal to length of cell-spot), outreaching the one below by half its length; with three subapical spots in interspaces 6, 7, 8, one above the other, the topmost a mere dot, the bottom one only slightly smaller than the one interspace 3, the middle one between the uppermost and lowest and the inner edge of the three in a perfectly straight line; besides an orange, not semihyaline mark in interspace 1 that is chevron shaped, the sharp end innermost, the top are linear and slanting obliquely from lower, outer corner of spot in interspace 2 to above the middle of vein in the middle of interspace, the lower arm much wider, thicker, slanting outwards to vein 1 at about three-quarters its length from base of wing; the yellow scaling leaves a bare space of ground-colour, oval in shape, bordering each spot in interspaces 6, 7, 8 and 2, 3 outwards. Hind wing. Extraordinarily variable as to the extent of the orange-ochreous patch. One specimen caught in the very wettest month of the monsoon has the whole of the interspace 4 including some of 5 above of that colour extending from the discocellulars (end of cell) outwards to three-quarters its length just to embrace a small longitudinally-oval spot of ground colour in its extremity ; and also interspace 3 (the brown vein separating the two narrowly) for the same distance out embracing another, similar spot of ground colour : and, further, the basal half of interspace 2 with the spot just beyond its extremity—these coincide with the postdiscal, curved series of brown spots sometimes present on the underside ; these spots covered with long, concolorous-ochreous decumbent hairs while the rest of the cell has them black and there is a line of similarly—long, not quite so decumbent, orange-ochreous hairs all along vein 1*b* to close to outer margin. In another

specimen also caught in the rains the cell underneath the (here) concolorous, long and decumbent hairs (none are black) is all orange-ochreous as well as the whole of interspaces 4 and 5 to near outer margin extending upwards slightly to top of interspace 6 beyond middle and downwards through interspace 3 to completely fill 2 to close to outer margin, the whole of the interval separating vein 2 from 1*b* with its fringe of hairs being covered with orange hairs also. In still another specimen caught in January the patch is as extensive as in this second one but has no sign of any brown spots. *Underside.* 'Fore wing with the costa increasingly, the apex broadly, the outer margin decreasingly dull, dark ochreous; all the rest of the wing blackish, the spots as on the upperside, the discal series with the chevron mark much paler, diffused, larger. Hind wing dark, dull ochreous; a thin, black bar closing the cell, a complete, discal, curved series of long-oval, blackish spots, one in each interspace commencing with one above middle of cell towards the base of interspace 7 and one beyond its middle, the last in the middle of interspace 1*b;* all veins blackish the abdominal margin and a streak in the basal two-thirds of the submedian interspace black.' (Swinhoe, *Lepidoptera Indica,* vol. x, p. 287.) Here, again, the marking is variable. In some specimens it is absolutely uniform dark-ochreous without a sign of any marking; in others Swinhoe's cell-bar and postdiscal spots are all there, only the black streak in the submedian interspace and on the veins is wanting; in others the submedian interspace is certainly darkish as is also the costal area above vein 8 and there is a submarginal series between the veins of dull-brown spots that may be quite obscure. And, which is peculiar, these variations are not dependent upon dry and wet seasons, nor upon sex. Antennæ with the shaft black but a yellow, thin streak on the underside towards top in some; in others slight indications of yellow on the undersides at base of each joint, the underside of club at base extending down along the shaft yellow, the apiculus dull red extending much further down on to the club above than below. Palpi brown above with some ochreous hairs, below pale-ochreous at base shading up to orange at end in some fresh specimens. Head and thorax orange above or ochreous-orange with a plentiful admixture of brown. Abdomen brown with very plentiful admixture of orange-ochreous scales on distal half. Legs orange-ochreous or pale-ochreous according to specimens. The fringe of hairs along inner margin of fore wing slight. *Cilia* of fore wing brown with darker base, the portion below vein 1 often ochreous; of hind wing ochreous with brown bases, altogether slightly brown in interspaces 2, 3 both above and below. Expanse 40 mm. or rather less for female; the male often as much.

The crook of the antennæ is bent back at right angles and short and the hind tibiæ are quite naked or with a very slight fringe of hairs.

Swinhoe says in his book: 'Female. *Upperside* coloured like the male. Fore wing with the spots similar, but there is only one spot below the two discal spots. Hind wing with the patch usually restricted to a conspicuous streak in interspace 4 and inconspicuous, thin streaks in 3 and 2. *Underside* paler than in male; all the markings similar but indistinct.'

Larva.—This caterpiller is, in *shape,* very like that of *Halpe moorei* but is altogether *sui generis* amongst this type of skipper larva as it is not concolourous; it is longitudinally marked with a dorsolateral, broad, rose-coloured band from segment 2 to segment 13, the dorsal area above it being more or less yellow, the spiracular area below it, white. The 13th segment is a narrow, transverse, parallel-margined piece, shorter than half the length of segment 12 and with a very slight dorsal slope backwards towards the anal segment; that segment, i.e., the anal one (segment 14) is semicircular in outline has a slightly greater slope than 13 and is about the same length as segment 12; the legs and prolegs are short; segment 2 is whitish and has a thin, transverse, black collar across its middle which is very slightly interrupted in the dorsal line; the body is thickest at middle and decreases slightly towards both ends; there is a distinct neck before the comparatively large (higher and broader than segment 2, equal about in diameter to segment 3), nearly round, thick *head* which is only very slightly indented in dorsal line on vertex between the lobes; the surface of head is shallowly and minutely honeycombed-rugose with a somewhat sparse covering of very minute, appressed, short, light hairs with some longer, erect, stronger ones on the edges of the ligula and around the mouth-opening; the clypeus is rather less than half the height of the head, a good deal higher than broad at base, triangular with an acute apex, the false clypeus outside it reaching slightly further up than half the height of the head, the strip formed by it outside the true clypeus rather broad, broadening from base upwards to nearly three-quarters its own height in a gentle curve, then the sides converging to an acute apex in dorsal line; the labrum nearly white, shining, transverse, not short (really the same colour as clypeus and head generally), the ligula also the same colour, longer than broad, semicircularly rounded with a rather deep, triangular sinus occupying the centre of the front margin; the antennal, basal joint light, the second rather dark red-brown; the mandibles red-brown also with much darker edges, this cutting edge straight, not toothed; the eyes: 2, 3, 4 in a straight line pointing to 6 under the lower curve of head, 1 behind and above 2 at an obtuse angle, all the first four equally spaced, 6 twice the distance from 4 that 3 is from 4, the 5th behind 4 and 6 and forming an equilateral triangle with them, all dark. *Surface* of larva covered with extremely minute, erect, soft, light hairs, hardly visible under the lens; otherwise smooth, the skin thin with the tracheæ showing through; the anal segment largely chitinized on dorsum and very irregularly wrinkled-rugose, black; the thin, black collar across segment 2 also chitinized. *Spiracles* of ordinary size, nearly circular and yellow; those of segments 2 and 12 larger than the others. The *colour* of the body is peculiar for one of the genus: there is a spiracular white band above which is a dorsolateral, rose-coloured band of about the same width with a shade of green in it, above this a subdorsal, slightly narrower, yellow band and a dorsal, greenish line; all longitudinal reaching from segment 2 at the hinder margin to the front margin of segment 14; the head is light brownish-yellow with, generally, a round, black or blackish or brown, single, rather small spot near the top of the face on each lobe. L: 29 mm.; B: 4 mm.

Pupa.—The pupa is also, in *shape,* like that of *Halpe moorei* except for differences that will be evident below; it is, however, very peculiar in the excrescences of the head and in the formation of the cremaster; the body is thickest and stoutest generally about the middle though the difference between the stoutness there and at the thorax and shoulders is very small; the shoulders are evenly rounded, the eyes prominent, the front squarely blunt, the thorax slightly and evenly convex-humped, the abdomen decreasing in width backwards more quickly after segment 7 to the narrowly square-ended cremaster; segment 13 is more or less intimately soldered to 14 and is about half its length (slightly more) and also half the length of segment 12; segments 11-13 with a gentle dorsal slope, segment 14 much more strongly inclined downwards; the hinder margin of thorax is a short parabolic curve about equal to a semicircle and meets the wing-line on each side in a broadly rounded angle of about 90°, segment 4 is about equal in length in dorsal line to segment 5, segment 6 is not quite twice as long, thorax is four times as long as 4, segment 2 is only slightly shorter than 4; the *head* is very peculiarly sculptured the whole frontal surface, inclined at an angle of about 80° to the longitudinal, axis of the pupa, is flattened between the eyes and raised very considerably above the pupal surface into a heart-shaped shield which is broader than long and has the heart-sinus posterior; this surface is very prominently and irregularly wrinkled-rugose and is separated from the head-vertex by a deep, linear depression of triangular section: the vertex behind this is also similarly raised and roughened in two pear-shaped pieces, one on each side of the dorsal line, the thin end of these pears touch the dorsal line and the broad ends reach down to the eyes, the breadth (in sense of length of pupa) is only half the length of the vertex, the rest of the vertex-surface being flush with the general pupal surface but roughened like the raised front pear-like portions; this flush vertex-portion is again divided into a dorsal, triangular part bordered in front by the pear-like, raised pieces with the base posteriorly formed by a fine line formed by the front borders of two longly oval, marginal pieces, one on each side of dorsal line and lying along the hinder margin of head; segment 2 is normal, not roughened, parallel-sided and in same plane as the head-vertex; the eyes are roughened in front; the cremaster is peculiar: it is composed of two pieces, the anterior nearly square, as broad as segment 13 (less than segment 12) and has its dorsal surface gently concave, its lateral edges raised considerably though somewhat thinly into sharp, low ridges leaning outwards with three or four backwards-directed, short, sharp, conical teeth; the posterior portion rather less than half the length and, at its extremity which is quite square (the extremity of the pupa) rather less than half the breadth of the basal portion; this end piece has its sides gradually diverging forwards to bend suddenly out to the hinder corners of the anterior, square piece; this pupal end is furnished with a somewhat diffuse bunch of stiff, golden-brown, suspensory shafts which are somewhat ventral and hooked at the ends; ventrally the cremaster has nothing noteworthy; the antennæ reach half way down the wings, the proboscis reaches the ends but is not prolonged. The *surface* is moderately shining, the abdomen finely granulate-rugose, the thorax more or less regularly, transversely acicularly rugose in parallel lines, the wings irregularly acicularly lined transversely; besides the rugosities on head and eyes noticed above; the segment margins distinct, narrowly satiny-rugose along hinder borders, the margins of segments 8, 9, 10 more broadly satiny. *Spiracles* of segment 2 are guarded behind by a very prominent, 0.75 mm. long, more or less oval surface or protuberance which faces forwards and has another, oblong, similar, raised surface in front of it, separated from it by a depressed line, this anterior, raised body black, the posterior one red-brown; the other spiracles are very light yellow, moderately broad ovals, flush, rather small. The *colour* of the pupa is waxy-white all over with a green shade, the rugosities of head, and eyes are all nearly black (very dark red-brown); the ridges of cremaster and teeth are rather golden red-brown; besides which the greater part of the lateral region of segment 2, a short, subdorsal streak (longitudinal) from front margin of thorax backwards and a similar dorsolateral streak on segment 1 (head-vertex) are black. L: 25 mm.; B: 5 mm.

Habits.—The larva is very shy, eating in the evening. Pupa in a longitudinally joined bamboo-leaf and fixed by tail; coating of fairly thick silk inside of cell, sometimes steps of silk also; whole cell very tightly closed. The larva generally lives amongst the dead, yellow leaves and makes its cell of several joined together. Is found both above and below the ghats, at Siddalgundi and Karwar. Four or five were obtained in March 1919; the first came from Siddalgundi on March 15, 1893; another from Udamakki on August 1, 1893; all in the N. Kanara, District of the Bombay Presidency. The butterfly is a powerful flier, frequenting the jungles where bamboo grows; keeping much to the higher stories of the trees where it goes freely to flowers for the sake of the nectar in the mornings up to eleven o'clock if there be shade, not so late if the sun is too bright. It was much attracted to the flowers of the Dividivi or *Cæsalpinia coriaria,* Willd., the American Sumach, a cultivated tree with extremely sweet smelling flowers that come out in October and June. The insect is not often seen; neither are the caterpillars easy to come by. Swinhoe gives the habitat as South India and Ceylon and says 'The types in the Indian Museum, Calcutta, came from the Palni Hills; Hampson records it from the Nilgiris; Elwes from Trichinopoli; Davidson, Bell and Aitken who bred it in Karwar, did not figure the larva and pupa.' The larva and pupa have, as a matter of fact, been painted but never published.

(*To be continued*)

THREE MONTHS UP THE VALLEY OF THE SUTLEJ RIVER

BY

LT.-COL. R. W. BURTON, I.A. (RETD.)

PART II

(*With 2 plates*)

Continued from page 39 of this Volume

III

> ' *To sit on rocks, to muse o'er flood and fell,*
> *To slowly trace the forests' shady scene,*
> *Where things that own not man's dominion dwell.*'
>
> —BYRON.

At 4 a.m. on May 30, the first day's *shikar* was commenced by an expedition up the main valley in search of ibex. Some climbing over precipitous rocks, with many a precarious hold above the raging stream below, opened out to better ground along the right bank of the river. About two miles from camp eight ibex were sighted. All had horns of upwards of thirty inches, and one buck appeared to be the owner of a fairly good head. Going further on more ibex were seen, eleven females and one small male. The party of eight came along and joined these. We followed the herd, they up the hillside we along the river, until there came a precipice which would force the animals lower down and so nearer to us. The best head appeared to be about thirty-eight inches, so I decided to take the chance that was offered. The distance was about 300 yards and I was that day, for the first and last time, using the ·280 Ross Rifle. No dust flew to the shot. The animal galloped a few yards and disappeared behind some rocks. The remainder of the herd were carefully counted across an open stone shoot which lay in their way. The big one was not among them, therefore he must be hit, and was possibly dead. Ramdass staying with me, the two men were sent up the valley to cross by the first available snow bridge and make their way back along the opposite side. Watching them I envied the ease and speed with which they moved.

They found the stricken beast lying down where he had disappeared. He galloped across the stone shoot and stood among rocks; but the distance was now greater than before: quite 400 yards. The last of four shots brought him rolling down the hill to come to anchor against some bushes. The men got the carcass down to the edge of the river and, after several attempts, I passed across a rope which, fastened round the neck, enabled us to haul the body through the rushing torrent of the icy stream. This saved much trouble : but he was very nearly lost, the weight of the body being almost more than old Ramdass and I could manage. The animal had been hit four times. Three shots were through the body—one of these through the shoulder—and the last had smashed the base of the skull. Having killed him I wished I had stayed my hand as the horns measured only thirty-six inches. He was in splendid winter coat. After this experience of the ·280 rifle I decided never to use it again. The ·375 would have killed the animal at the first shot. On the way back to camp tracks of a snow leopard were seen along the river bank. There was a curious yellow halo round the sun. The men said that it portended continuous fine weather.

The last day of May was spent in camp, seeing to the ibex skin, doing odd jobs of mending, and making preparations for a four days' bivouac further up the river.

The dawn of the first of June disclosed a cloudy sky and snow falling on the higher hills, so on this occasion the halo was at fault. We made an early start, the party consisting of the three *shikaris* and Panchram, one of the Chakrata coolies. We went far up the valley and, turning up a side ravine to within the snowline, the men settled themselves down in the ruins of a last year's shepherds' hut. My bedding was laid out at an angle between two low stone walls which kept off the wind, and a green waterproof sheet rigged up overhead furnished sufficient shelter for ordinary weather. On the whole the camp was quite a good one : fortunately there was neither mist nor snow. The hills round about were very rugged and precipitous but had no terrors for me. Wearing the woven grass shoes brought from Chakrata I could go over any sort of ground in safety.

The first day's excursion, still further up the main valley, was made over difficult country, steps having to be cut in several places across the steep slopes of frozen snow. The junction of the Spiti nala with the Thamin river—now reduced to but a miniature of itself—was reached, and it was made certain that no ibex had yet gone beyond that point. There were no tracks in the snow and no grass had yet appeared. Several lots of ibex were seen on the way up, but no head worth having. On the hillside opposite camp was the herd of eight ibex which had been reduced to seven. Our quest being now for bear and not ibex, to remain further at this bivouac was useless, and a return to the main camp was made the following day. Some wild onion was found, also two kinds of rhubarb, the variety with the smooth leaves being less bitter than the crinkled leaf kind which is mostly found at a higher elevation. Both of these, with plenty of sugar, formed an acceptable addition to camp fare.

The camp on the right bank of the river was a very pleasant one, well sheltered from the wind, which, coming as it did from regions of perpetual ice and snow, was bitterly cold. The sun gave us its grateful rays during sufficient hours of the day, and there was plenty of fuel. As is the case with all snow-fed streams, the river rose considerably each afternoon and became turbid with silt. The roar of the waters and deep rumble of heavy stones being slowly ground to fragments by the rushing torrent was most soothing and conducive to sleep after a tiring day.

On June 4th the *shikari* coolies went to find a way across to the country east of the Pamachang stream and returned in the evening with news of fresh tracks of snow bear. A long round of some five miles brought us next day to bivouac on the opposite side of the river and but a stone's throw from the camp we had just left. On the way tracks of a snow leopard were again seen, as well as those of a small snow bear. Both of these animals had passed along the further side of the river, but a short sixty yards from my tent, during the previous night. The tracks of the bear led over our bivouac ground and away up the hill.

In the evening, following up these tracks, we came across the remains of an ibex, killed some five or six days previously by a snow leopard, as could be seen by the marks in the skin of the throat. It had been eaten by him, and a large red bear had also been at the carcass. The leopard had bagged a better head than I ! The horns measured 42″ by $10\frac{1}{4}$″ in girth. Ramdass said that heads better than this are not to be found in that country, and he was probably correct. The night's tracks of the big bear were found higher up the hill, after we had tracked him to his lair of the previous day among some thick bushes, but no view of him did we get although we waited until it was nearly dark. Search next day showed that he had not again been about the hill so it was decided to move to a camp higher above Rupa. Had time permitted a few days' further stay would probably have enabled this fine bear to be bagged. That is the worst of not concentrating on one description of animal where animals of any kind are so few. Burhel were also wanted.

At dawn next morning it was found that the big bear had again been all over the hill. Every possible cover was searched but he was not to be found. *Shikari* men said he had smelt my footsteps and so decided that it was safer to sleep elsewhere during the day. Some ram-chukor were seen, and the tracks of the small bear followed the high-level path, leading towards Rupa for several miles. About twelve o'clock three burhel rams were sighted in a wide valley. Almost as we saw them the cries and song of a cattle herd far below caused them to begin to travel up hill. The leading ram had fair horns, the second one a small head, and the last of the three carried a good head: probably 26 inches. At first it was doubtful which way they intended to go, and how far. The leading ram was pretty to see as he pugnaciously rose on his hind legs and butted at the second one. He did this several times, on one occasion making a leap of about fifteen feet which the other fellow wisely let pass without attempting to meet the downward assault.

After five minutes' watching it became evident that the animals intended to cross over, high up on the same spur as we were on, so no time was to be lost in going up our side of it. The elevation was some 12,000 feet, and progress, on my part, somewhat slow. The impatient *shikari* cooly had to wait many times for me, and the burhel were a long three hundred yards' distant when I pantingly gained the shelter of a bush at the hump of the spur. That five minutes' delay, watching the animals, had been fatal, and lost me the big ram. With these few minutes in hand, we would have been under cover waiting for the rams to file quietly past at short range. Having waited for the burhel to disappear over a ridge half a mile or more away, time was given to them fully to disappear; for sometimes a ram will return to the crest and re-survey the country just passed over. We followed as fast as possible. The *shikari*, leading this time by a couple of hundred yards, gained the crest and at once frantically beckoned to me—poor breathless and winded me—to hurry up! Doing my best I arrived much pumped, to see two of the burhel disappear round the next spur, probably for good, as the next sight of them would be at long range. The biggest ram was standing in the little valley below us, only a hundred yards distant, gazing up at the ridge. The *shikari* cooly had evidently been incautious as to how he looked over on his first getting there. Old Ramdass would not have committed such a fault. It had been necessary to let the cooly push on in order to keep the animals in sight. No time was to be lost: but I was in no condition to shoot straight. The wobbling ·375 sent a bullet just under his chest. There was now time to gain breath, judge distance, and make ready in lying down position for the long shot which it would be necessary to attempt; and which was justified by the circumstances. Animals were difficult to find, and remaining days for *shikar* were becoming alarmingly few. Two of the rams soon appeared, making their way up the rocky spur which we knew must be their way of retreat. They were the small and the big ram. My rifle is oversighted, as are almost all rifles of the H. V. class. With the 200 yards leaf, good enough in that rarefied air for any distance up to 400 yards I nearly got the big ram: missed him by inches only, just under his body. This gave me the exact range, but the ram disappeared among the rocks. Then the third ram, the former leaping leader of this small party of gentlemen, came into view. The first shoot went just over him. He stood, fortunately, and the second, taking him in the near hip, broke both his thighs. The distance was over 350 yards. He lay where hit, then slithered down a small shale slope until checked by a large stone. Lying there, his colour blending with the shale, he was invisible to the naked eye, an object lesson of how marvellously wild animals can at times suit their environment.

The two other rams again came into view among the tumbled rocks. The big fellow bore a charmed life. The two bullets went exceedingly close; one, the first, must have been not two inches over his back. I saw the spurt of snow dust. This was with the 300 yds. leaf. He made a standing leap of at least fifteen feet, obviously untouched, and again stood at gaze. On being missed a second time he quickly disappeared amidst the snow covered rocks behind which his young companion had already been lost to view. His agility was astounding and equal to that of an ibex.

To get to the fallen ram took me some time, there being much bad and difficult ground to be negotiated. He was in thin condition: horns 23″ by 12″ in girth. Having secured a photograph of the prize we made our way downwards, meeting the remainder of the party eagerly climbing towards us to find out the result of so many shots. We got to camp above Rupa by five o'clock in the evening, having been twelve hours on the go and much of the time over vile ground. After a stay of one day in camp a move was made to a bivouac at a much higher elevation, about 13,000 feet, the climb being fairly steep. On the way up five burhel ewes were seen. The sight of three more in a valley beyond the bivouac raised hopes that perhaps more game would be found on the morrow.

The sky was now quite clear. On all sides nothing but snow was to be seen. The mountains extended in all directions, range after range, peak after peak. To the north, some two miles from camp, was the snow covered range dividing the valley of the Thamin from that of the Spiti river. To the north-east could be seen the Hangrang pass leading to Hăngō. The path to it, which started from the village of Sūinám, could be seen now and again as it wound upwards over the rounded spurs of the mountains, until it disappeared from sight above a stupendous precipice of reddish sandstone, streaked with strata of many hues. The glories of the near and distant mountains were spread out before me—high ragged ranges shooting up into the sky in all directions, the vision lost in a sea of peaks. No wind, not even a distant sound, disturbed the silence.

The next morning an early start was made, as it was intended to cover all possible ground in the search for burhel. Quite close to camp a lovely yellow fox was seen. He had a white tip to his tail, and stared unalarmed as we made our way along the hillside through the stunted gorse-like juniper. Valley after valley was searched without success and the *shikaris* confessed themselves unable to say where the burhel rams could be found. During the day two more yellow foxes were seen. They were a long way off, and the men insisted they were a small kind of panther and were the cause of our being unable to find burhel! My telescope showed very plainly what animals they were, but the men remained wilfully unconvinced. One of the foxes was playing very prettily in the snow after the manner of a happy dog.

It had now to be decided whether to remain in this valley and make an effort to bag a snow bear, or to retrace our steps to Pangi and try for burhel in the neighbourhood of Charong. A man was sent down the hill for baggage coolies ; a decision could be arrived at in the morning when camp was struck and the loads packed : and so passed a second night under the glorious canopy of the starlit heavens.

'The 11th June, and Charong it is!' The coolies arrived at seven o'clock, so, starting down the hill by eight, Rupa was passed and Suinam reached by two in the afternoon. The *shikari* men were quite pleased with ten rupees each as pay, and two rupees eight annas each as *bakshish* for animals shot. Twenty rupees a month is good pay for *shikaries* in those parts. They asked me to come again, and were eager to take me further afield, so perhaps I overpaid them. They said that March would be the best month as all animals would then be at low elevations and snow leopards would not be difficult to get.

At Rupa I took a photograph of the village, ascending to the roof of the younger *shikari* man's house for the purpose.

The names of the men were Charung Tanjan and Tikaram, the latter being a very intelligent youth. I took a great fancy to him and would gladly have him with me again. The temple at Rupa is of the usual type for this part of the world. A very gaudy gilt covered image of Buddh was the principal feature of it. All round the walls were paintings of Lamas and devils executed by an artist from Spiti. A man of the village had lately died at Pangi on his way up from Rampur and a number of red clad Lamas were holding a memorial service, so I gathered. At Chămong 'Motee' was taken over in fair condition and four rupees disbursed as his keep for sixteen days. On this day the last of the burhel mutton was consumed; and glad I was, as the muscles of my jaws were getting enormous from the heavy exercise. Never was there tougher meat. When the animals are shot in autumn, after months of splendid grazing, the flesh is excellent; but in the spring, after a winter's diet of hardy shrubs and such like fare, the reverse is the case.

The return journey down the valley showed how much the aspect of the country had changed during the past fortnight. The poplar trees were now in leaf; snow bridges fast disappearing; hillsides green; and people busy in the fields. Near Suinam village a number of children from four to ten years of age were being made to weed the fields. They began early in life to learn to cultivate; to carry loads; and to tend the village stock. A small baby was brought to me to have its foot doctored. There had been a severe burn but the wound had sufficiently healed. After application of some ointment it was bandaged up, and the mother went away highly pleased with my safe assurance that all would be well with the little one's foot in a few day's time.

It was hot, toiling up the hill from the iron bridge to the Benang Pass. Nothing had yet been done to the 'road'. That portion of this road between Shiasu bridge and Poo—the mission station below the Shipki Pass—was said to be so bad as to be dangerous; it being not uncommon for laden animals to fall and be killed, with total loss of goods to the trader. This state of affairs struck one as somewhat strange in view of this being one of the trade routes between India and Tibet; and the fact that a British Trade Agency was established at Gartok so far back as the year 1904.

On arrival at Jangi on June 15, the unwelcome news was received that no extension of leave could be given as circumstances necessitated my transfer to another cantonment: so next day I set out for Charong, crossing the Sutlej by the 'Jhula' below Akpa village and proceeding to camp at the picturesque village of Rispa. The 'Jhula', or swing bridge, was a substantial affair of galvanized rope wire, the means of crossing being by a wooden seat hung on the main rope and pulled backwards and forwards from either side. The cooly Gangaram, a man of timorous nature, was unashamedly terrified at having to be swung in mid-air over the roaring river! I had him tied in as a matter of wise precaution. Some of the baggage damsels who came from Rispa to take on the loads were very nice looking, and more extremely pretty women were seen up this valley; also many men, and women, who were the reverse of good looking.

The day's journey of June 17th took us from Rispa to Lamber *via* Tangi, the first mile or so being along the left bank of the Sutlej. Leaving the main river the path turned up the Tadoong Gad, to cross it a short distance up by a ford, and then wind up the hill sides, mainly through fir woods, to the village of Tangi, which occupies a fine commanding position on an open spur of the mountain. Looking backwards there were very fine views of the Kashang and Ashang Valleys and the snow covered mountains encircling them. After Tangi the path descended again to the bed of the nullah, and from there the remaining two miles to Lamber was mostly a scramble over the boulders of the bed of the stream.

At Lamber the people told me that the rest of the 'path' to Charong was of the same description and so I found it, being fully satisfied by evening with the exercise afforded by this tiresome march of thirteen to fourteen miles.

There was an earthquake near Lamber in April of that year, and a large piece of the hill side tumbled into the river. The occurrence took place at night and gave the villagers a great fright. Three men of Charong were on their way home and, bribed by a box of matches, sat for their photograph, which turned out to be a very good one. Three uglier countenances never faced a camera.

The gorge of the Tadoong stream from Lamber to the junction with the Kuno nullah is a most imposing one. Many of the mountains thereabouts are quite inaccessible, the precipices being immensely grand. Within six miles on either side the mountain ridge is over 20,000 feet, some of the peaks being as much as 21,800 feet in height; so it can be imagined how precipitous are the mountains, rising as they do from the river bed (10,000 feet or so) to those great elevations. At one spot there was a glorious waterfall, many hundreds of feet in height, thundering down the perpendicular cliffs. There was a large volume of water, all melted snow, rushing down the rocky stream: but it was merely a trickle compared to what it would become as the summer months progressed.

Coolies were changed near Kuno: the path from this place to Charong being quite good, camp was pitched by three in the afternoon. Late in the evening, standing at the tent door, I sighted two burhel ewes on the opposite side of the river valley.

IV

To climb the trackless mountain all unseen
With the wild flock that never needs a fold!

—BYRON.

The local *Shikari*—Durjan by name—was about to start off to Tibet on a trading expedition, but was induced to remain for three days. Camp was moved on the morning of June 19th to about seven miles up stream from the village of Charong. On the way a good many burhel were seen, but none carried horns of much over 20 inches. At daybreak on the 20th, accompanied by Durjan and two coolies, I went some miles further up the bed of the river. Three lots of burhel were found—twenty-four animals in all—but there were no good heads among them. A lofty hill was climbed much of it being very steep, and a view of the entire opposite hill-side obtained. There were many burhel scattered about, and it was interesting to watch them. At about 9.30, they all began to move upwards among the snow to lie up for the day. The younger rams were very playful, sportively butting at one another, and it was a pretty sight to watch their gambols.

Higher and higher we climbed to attain a ridge well within the snow line. From there a splendid view of the magnificent scenery was obtained. Nothing is more fascinating than to roam along the crest of the higher ranges in mighty mountains. You feel that the whole country below is yours : in it you are supreme. Also you feel what a very very insignificant creature you are! In the vast sea of mountains and valleys unfolded around you, you feel a wild, unfettered freedom; you follow the sheep trail, always a good path, leading you securely round the pinnacles: with strained excitement you walk slowly along, every step bringing new pictures in view: you look on a vast bewildering landscape of lofty ranges rich in colour, abounding in sculptured crags, deep ravines, and green basins—the desolation relieved by the shrill call of the ram chukor and the majestic sailing of the lammergeyer in the brilliant blue of the sky.

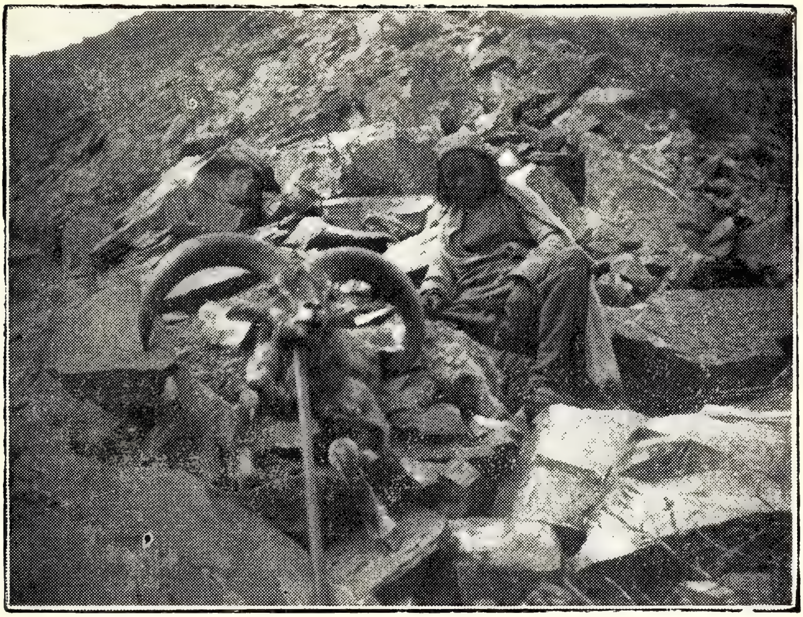
In this way we carefully wound our way along the slopes of the mountains for several miles, thoroughly searching four large valleys and, gradually descending, to finally arrive at a magnificent grazing ground of wide undulating grass downs. A few ewes were all we saw. We then made our way by downward sheep paths to the main nullah, and so to camp—a long dreary trudge over the slippery boulders of the stream. At one place the snow bridge, by which a crossing was imperative, was broken down, leaving a wide and gaping fissure over the torrent below. This had to be jumped and it was a relief to be safely across. Further on the snout of a small glacier was passed, the twenty foot thickness of ice showing a deep emerald green where it was sharp cut and overhanging the bank of the stream. Camp was gained just as the last rose tints of the setting sun faded from the fleecy clouds surmounting the perpetual snows. The elevation attained during this day, the most exhausting with exception of one strenuous day in Kashmir in 1923, which I have ever experienced, was well over 15,000 feet.

Perseverance is often rewarded. The alarm clock was set for an early start the following morning, the intention being to again look up the many animals seen the previous day, with the forlorn hope of finding a shootable head. Standing at the door of the tent just after day-break Durjan drew my attention to some animal far up the hillside above the camp. The field glasses showed three rams of which one possessed a good head. The fine sweep of his horns was silhouetted against the sky as he stood on the brow of the hill. In a few minutes the animals disappeared from sight, and we at once started in pursuit.

The climb was not very steep and the distance about 1,200 yards. Arrived at the top all likely ground was searched in vain, so the *shikari* started back to pick up the tracks and find which way the animals had gone. I sat down near a bush with rifle and field glasses ready. Having proceeded only some sixty yards up the slope the *shikari* whistled and pointed. Two burhel were just topping a ridge about 120 yards distant. They were among rocks, and difficult to define. Quickly putting up the field glasses one of them was seen to be the big ram. He was gazing in my direction, and only his chest and part of one shoulder was visible. The shot, quickly taken, was fortunately a good one, the bullet striking the point of the shoulder and making its exit behind the shoulder on the opposite side. The ram fell dead in his tracks and his smaller companion fled clattering down the hill. I was delighted to find the horns taped 26 inches. A very handsome trophy indeed. The cooly with us carried the animal on his back up a steep slope on which I had to go, in places, on all fours! He was helped, certainly, by the *shikari*, who steadied him by holding on to a horn, but the performance was pretty good as the animal weighed 140 lbs. He carried him with ease down to the camp.

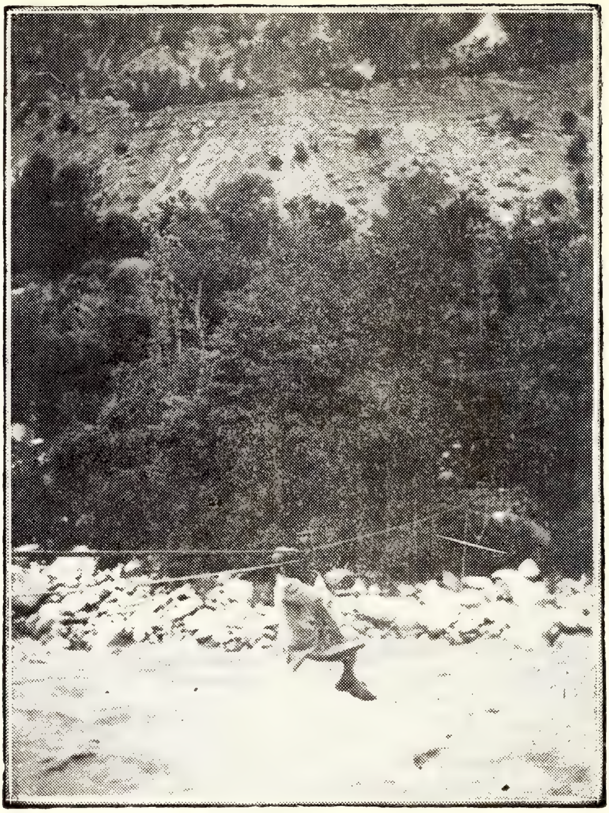
The bagging of this burhel was a great stroke of luck which I felt was deserved, and steps could now be retraced in hope of a snow leopard, said to be killing sheep near Kuno, and perhaps a snow bear up the Kashang Gad from Pangi. The *shikari* assured me that this 26 inch burhel was the biggest as to horns that he had ever seen shot. That the burhel of these parts *do* grow larger horns was certain, as one—a very old and much weather-worn head—which I saw at Ramrikcha temple near Charong measured 28 inches, and must have originally been quite an inch longer than that. The people told me the many horns at the temple were those of animals killed by snow avalanches, but I suspected that a number of animals were killed by being driven in the snow during the winter months.

The *poojari* at Ramrikcha temple had some scars on his face, the result of an attack by a snow leopard. It seemed that a few years previously a snow leopard got into a hut near the temple, where sheep were kept at night, and killed twenty-one of them. The next evening he was around the place again. The *poojari* saw that the murderer was after some goats so went out to put them into a hut. The leopard apparently resented this as he went for the priest and clawed his face! That same night the leopard visited Charong village, a mile away, and attacked and clawed a woman there. The villagers decided that the animal must be killed, so tracked it to where it was lying up among some bushes about half a mile off and, surrounding the place, slew it with stones and sticks without damage to themselves. A plains panther would not have died under those circumstances without leaving his mark on a few of his assailants. At Chakrata a panther—a small

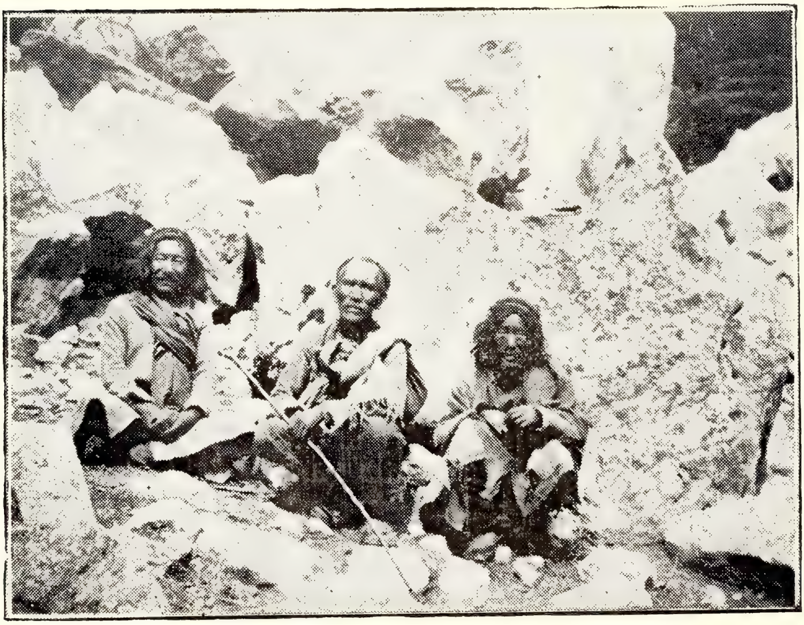


A FINE BURHEL—26½″

IN THE TADONG GUD
' River, Ravine and Splintered Precipice '



THE TIMOROUS GANGARAM CROSSING THE SUTLEJ



THREE HANDSOME MEN OF CHARONG

female—was brought to me for the Government reward, having been killed by a villager with a blow from a hatchet. The skull was cleft to the brain. It had attacked the man after being wounded by a companion with a gun.

On June 22nd camp was moved to Kuno, the *shikari* coming with me as he was eager to catch up the people with whom he was to go to Tibet. His way was up the Kuno nullah at head of which is the Sholarang pass,—six marches—all the way being over the rough bed of the stream. I did not envy him his journey. The snow fall at Charong is heavy and the people cannot leave the village during the winter. A few of the men go to the lower hills with goats and sheep, but most of them, and all the women and children, remain in the village. A great store of firewood has to be collected, and all grain has to be ground by hand as the frozen water mills cannot be worked. The principal occupation all those weary winter months is weaving cloth and knitting.

On leaving camp for the march to Kuno I went up the hill where the burhel was shot and was rewarded by the magnificent view in the clear morning air, also a photograph of Charong Peak 19,000 feet—which had been under cloud on the previous day. Towards evening it was evident that bad weather was coming on as it began to rain ; mists were stealing along the higher slopes, while all the mountain tops were hidden in clouds.

At Kuno there was no further news of the snow leopard. Days were precious, so it was decided to make for Pangi without delay. There was rain during the night and a village dog seized the occasion to steal half a pound of butter, also the burhel head which was, fortunately, retrieved undamaged. A group of the women and children of Kuno was taken, as also a photograph of a ‘ zho ’ the half cow, half yak, of those parts. Camp was struck about nine o’clock, after the tents had dried, and the march to Lamber accomplished by the evening. Consequent on the recent rain and more rapid melting of the snows, the river was now more noisy and turbulent and had greatly increased in volume. The water was of a light coffee colour instead of the lovely green and blue hues seen on the upward journey.

During the early part of the next day light rain was falling for some miles of the way, everything getting thoroughly wet. All were glad to find sunshine and dry weather in the lower reaches of the valley. Many people from all parts of the country were met journeying to the Ramrikcha temple, a twhich an annual fair was to be held during the next few days. From Rispa to Rorung the journey was uneventful. Gangaram was once again in a great funk at having to cross the Sutlej, now far more formidable in appearance than on the sixteenth of the month. He tied himself in like a piece of luggage, and, seeing the state of his nerves, the merry damsel at the winch kept him dangling in mid-air over the raging flood. Shouting with glee she pulled him backwards and forwards in tantalizing fashion before winding him in to the safety of the landing platform. One cannot imagine a woman of the plains doing that !

The walk to Rorung was a very pleasant one through terraced fields, much of the way being under the welcome shade of walnut and apricot trees. Extensive vineyards with prospect of many luscious bunches of grapes were seen near the village of Akpa. The view from Rorung was very fine, almost as grand as that from Pangi where we arrived on June 26th.

Six days could be spared for *shikar*, so on the following morning I went up the Kashang Gad, seeing splendid scenery on the way, and camped near the snow line at a place called 'Poki'. Simple names they have in this part of the world. Poki: Jangi: Pangi: Tangi! My *shikari* was a cunning looking fellow and I did not anticipate much sport. Next morning the previous nights tracks of a medium sized snow bear were found half a mile above camp. The tracks led over into the Ashang Gad, the animal being no doubt in search of food as wild carrots were not yet above ground in this valley. Week old tracks of a few burhel, and of a snow leopard, were also seen: but a prolonged reconnaissance made it fairly certain that, except perhaps for a stray bear, there was small hope of any *shikar*. The night was very cold, and the skies again quite clear. A second day's weary search for game proved it useless to remain any longer in this much talked of valley.

On June 30, a return was made to Pangi. The transport was somewhat varied, being made up of one bullock, two donkeys, two girls, one woman and one man. The man had the largest pair of hands I have ever seen on a human being.

At daybreak on July 1, I went up the valley north of Pangi to a bivouac at a camping place the people called Ting Ting. The elevation was about 13,000 feet. Three coolies, one of them a female lama—a nun I should call her—carried my kit. In the afternoon a walk to the snow line level enabled a large extent of country to be examined. Three burhel ewes were seen. The country was ideal for wild sheep, and the *shikari* said they were plentiful three years ago; but could not say why there were now so few. Doubtless he had himself been pretty busy reducing their numbers.

The hillsides were now becoming carpeted with flowers of many varieties. Purple iris, buttercups, daisies, pimpernels, forget-me-nots, and many kinds of small flowers of varied hues were all around me wherever I went. The clover was already ankle deep. I was sad at the thought of having to leave all this loveliness and wend my way back to the drab heat of the plains.

The vast panorama of mountains was very beautiful. Below, and on either side, lush grass land sloped down to the fir forests, which were parted by the silver streak of the rivulet hastening to add its waters to the mighty river far down the valley. The lofty range behind camp stood out boldly, its high turreted rocks and rough peaks forming fantastic shapes against the sky line. The camp fire burned brightly. Beyond the cavernous depths of the Sutlej cañyon uprose the mighty masses of many snow-capped giants. The sunset on the snows was magnificent, and just as the last lingering rose tint faded out of the sky, the great round orb of the full moon appeared over the edge of the mountain and flooded the scene with its soft luminance. The stars at that altitude appeared twice as large and brilliant as at lower elevations. All was peaceful ; and the glamour of the wondrous scenery was upon me as my eyes closed in the dreamless slumber of a night in that perfect air. The memory of that evening of the first of July will not easily fade from my mind.

The dew that night was very heavy, so much so that blankets had to be dried in the sun until near eight o'clock. When we started down the hill the coolies gathered flowers and placed them in their hats, and the lady lama very prettily presented me with a flower for my own headgear ! I ascertained from her that any man, or woman, who wishes may become a lama. A married woman may also take the vow, but has to pay for the privilege. The nuns wear no ornaments, and their hair is cut short like a man's—not like a man of Kunawur—he wears his long ! Some of the nuns wear pyjama trousers but this one had the usual blanket dress. They are not exempt from ' begar ', and among the lamas only the well-to-do men are excused this work. But now that the ' begar ' system has been abolished perhaps the custom has been changed.

That same evening we got to Chini and found a great change in the appearance of the place. There was much vegetation: many flowers : wonderful blue and purple iris : huge white and yellow flowers, like daisies but three inches in diameter: splendid roses of pink and yellow in many shades; nature was indeed busy putting forth her powers after the long winter sleep. The fruit was not yet ripe but cherries, gooseberries, asparagus, and several kinds of vegetables were brought to me from the Salvation Army garden and formed a very welcome change of diet.

Some remarks as to the country and its inhabitants may be here suitably inserted. Kunawar is the name of that portion of the State of Bashahr which lies beyond Wangtu. It is recorded that the people of Kunawar, alone among the neighbouring States, successfully resisted the Gurkha invasion of these hills. I saw nothing to enable me to suppose that the men of Kunawar were of such a warlike disposition. After passing Chini the influence of Buddhism becomes more and more marked : and Hinduism fades off gradually into the Buddhism of Tibet. Lamas in red and in yellow robes are to be seen, and the main walls and lamaist gateways are commonly met with.

The men of Kunawar wear caps of two kinds : a round one of wool, like a tam-o-shanter without bob on the top ; or a round cap, pork-pie shape, with edge turned up for about three parts of the way round. These are sometimes trimmed, as to the turned up part, with red cloth. Puggries are not worn. Shoes are mostly of woven wool with soles of rough leather. The goat's hair and grass shoes of the lower country are not seen. Clothes are of the excellent all-wool homespun material. It is made in lengths of about ten yards with a width of 21 inches. Such a piece, to a casual purchaser, was about Rs. 16. After weaving, the cloth is put into water and then well stamped on and kneaded by the women. They can be seen at this work practically every day at every village. The dress of the women is a blanket, worn as a coat and skirt, the spare stuff being folded behind and falling from the waist. This one piece costume is held up by a rope of goat's hair passed round the waist. In some cases a woollen coat is also worn as a bodice. This style of dress has the appearance of a coat and skirt, and is well suited to the climate. The men's coats are very loosely made, with large sleeves, and are long, as a rule down to or below, the knees. Trousers are of inferior, and more coarse, material than the coats. All the people carry a blanket and a goat's hair rope at all times. When not in use the blanket is rolled up round the waist. Much of the population emigrate in the winter to the lower valleys, taking the sheep and goats with them. The custom of the country is that the inferior when meeting with a superior always takes the downhill side of the path; and a low caste man, when speaking to a superior, has to cover his mouth with his hand to prevent his breath reaching the face of the man of higher status than himself!

The weather was now much more warm, so the fourteen miles to Urni on July 5th seemed long and tiring. 'Motee' was requisitioned to carry me some miles of the way—the first time he had been ridden since the march from Darangati to Sarahan—there being now no need to keep in training for the strenuous mountain work. When passing Rogi news was brought of a villager having that morning fallen off the 'jhula' by which the crossing of the Sutlej was effected. He was instantly swept away in the roaring flood, and can have lived but a few brief moments in those icy waters. Gangaram's reception of the news seemed to indicate that he felt he had not been quite so foolish as was thought at the time of his timorous crossing on the way to and from Rispa.

The valley opposite Rogi, access to which can be had either by way of Kilba or by this 'jhula' below Rogi, is said to provide lovely scenery, superior even to that of the Chini Valley. It is possible to travel by this route and so gain the valley of the Tons River: but it is a journey concerning which enquiry should be made. The pass to be crossed at the head of the valley would have an elevation of about 15,000 feet.

At Urni the house flies were very bad. They nearly ate me and my tea, and even after dark did not let me have dinner in peace. Flies are always a great plague at staging bungalow and near villages in the hills during the summer months. When crossing the river at Wangtu the increase in the volume of water was very marked. The noise of the rushing torrent was tremendous, it being difficult to make oneself heard. The valley was much changed in appearance, all being now green and luxuriant where formerly it was bare and rocky. Fortunately the day was cloudy or it would have been exceedingly hot in that narrow gorge. Many flowers were seen, among them a large white flower growing on a creeper. It had a most delicate, exotic, perfume.

The Forest Bungalow at Nichar was very shady and cool. It is beautifully situated, being enclosed by stately deodar trees, with an unhampered view of the rugged precipitous hills on the far side of the Valley.

The views on the way to Taranda and Sarahan were just wonderful beyond description. Everything was clear and fresh. Wild flowers, ferns, and bracken were in luxuriant profusion. Jewelled butterflies flitted in sun and shade and the distant hill sides were shrouded in a lovely blue and purple haze. The road was now thronged by mules, ponies, and bullocks taking food supplies to the many hundreds of sawmen and wood cutters working in the forest. All the forests of Bashahr and Kunawar are under long lease to the Imperial Forest Department. A wise arrangement. Many of the animals met with were bleeding at the nostrils owing to the leeches which infest the lower hills at this season of the year. For the most part the beasts looked fat and well fed. The men with them were Bunjaras, but not recognizable as being of the same race as the much finer looking gipsies of the Deccan: those nomadic people whose bullocks formed the bulk of the transport for the armies of the campaigns of the Duke of Wellington.

Mules conveying grain carry two maunds and payment was made at Rs. 4-8-0 a maund, whereas the payment for the slower travelling bullocks, carrying the same weight, the same distance, was Rs. 3-10-0 a maund. A number of sheep and goats was also met with, each animal carrying his little sack of grain: some of them were going to Rupa and other villages of the Thamin Valley. There is a very busy grain trade to the higher valleys of this country, and the Hindustan-Tibet road, so far as it goes, must be of inestimable benefit to the people. The herds which take grains to Tibet return with wool and other produce of far-off Tibetan villages.

The sloping roofs of houses of Sarahan, Taranda and other villages are of wooden planks; those of Gaora and the lower country are mostly of stone slabs. Cultivation is now more extensive and the valley broadens out, showing that one is leaving the higher mountains. Gaora Bungalow is at an elevation of 6,025 feet and commands a fine extensive view. The roar of the Sutlej could be but faintly heard. The descent from the comparatively cool temperature at Gaora to the heat of the valley at Rampur (3,280 feet) was somewhat unpleasant—even at that date, July 10. The icy flood of the Sutlej however made an appreciable difference when one was on its banks.

The P.W.D. Rest House is about three-quarters of a mile east of the town and is on the bank of the river, which runs at that point between perpendicular rocks of marble like formation. Passing through the wide clean streets of the town a number of public buildings are seen; all well built and of pleasing design. The Guest House where I stayed is some little distance down stream from the town, and not far from the river bank, the rush of the waters being pleasant to the ear.

Rampur is the first place up the valley of the Sutlej where Lamaist buildings are to be seen. That at Rampur is a quite recent structure. It contains modern frescoes and a huge prayer wheel. In one of the Raja's garden houses are some lamaist frescoes. One fresco represents the treaty between Tibet and Bashahr concluded about A.D. 1650, when Bashahr was supported by the Moghul Emperor. In the middle of the picture is a figure apparently meant to represent the Moghul Emperor surrounded by his soldiers. A party of Bashahr people, distinguished by their round black hats, are placed in front of the Moghul, while the embassy from Tibet is on the right side of the painting. The Tibetans were beaten by the Moghul Army and had to cede the Sutlej Valley down to the Wangtu bridge to the Bashahr State.

I was very glad to leave the steamy heat of the Rampur Valley and get to Bahli. An early start was made on account of the heat, and the three or four miles along the river accomplished before the rays of the sun got to the valley. The transport consisted of five mules and four coolies. One of the mules fell down the hill side but the damage to the load was fortunately not great, and the mule was unhurt. The gradient of the path was good, so the rise of 4,800 feet in seven miles was not felt. It was cloudy most of the day but the view of the snows over towards Bhabah nullah was very fine.

The Soongri and Bahli villagers were just then visited by a severe influenza epidemic so there was some difficulty in obtaining coolies for the march to Roru. Enhanced cooly rates had just been promulgated so the last two marches in Bashahr were slightly more expensive. The valley below Soongri was looking exquisite in its green summer garb. Each range of hills seen on the return journey at these lower elevations had a different shade of colour. As range after range recedes in the distance the colour changes from the bright green of the nearest to the dark purple of the distant hills. Those wonderful landscapes! The inhabitants of those beautiful hills should indeed be happy: doubtless they are, their faces show that, but their life is a hard one in many ways and counterbalances to some extent their climatic advantages.

Nearing Roru there was heavy rain, but the baggage did not get wet. I rode 'Motee' to keep the saddle dry. The Pabar River was in heavy flood; and stranded against a rock in mid-stream was the carcase of a huge buffalo, his very large horns conspicuous against the flood. Two king vultures were busy picking the bones of the unfortunate beast which had most probably fallen accidentally into the torrent and been swept away.

Between Arakot and Tewni the people complained to me of the damage done by sambur to their crops along the valley. There are many sambur in those forests. Tewni was hot: how hot I cannot say, as my thermometer had been left at Rampur. I managed to catch a few labeo and rohu, up to three pounds in weight, but no mahseer. The Tons is at all seasons an unsatisfactory mahseer river.

On July 19 we got to Kathyan—'Motee' and I! In former days I had always hoped for a panther at this place but had no luck. An entry in the visitors book under date October 22, 1918, recorded that an official on tour had shot a panther—7 feet 3 inches in length-from the west bedroom window; so perhaps 'Judy' and two other dogs taken by panthers close to the bungalow in June 1914, were avenged. It was near here, in the village of Chajjar, that I took a photograph of a dog which had been three times grabbed by a panther and survived the adventures. This was due to his heavy spiked collar. I now learnt that he had recently died a natural death. Between Kathyan and Mundali the Sianas arranged two beats for bear, without result. This valley always holds bear in September when the crops are ripening.

That night at Mandali there was a heavy thunderstorm. The clouds grew black, lightning flashed along the crest of the hills, peals of thunder reverberated among the woods, small rivulets soon became rushing torrents. In the morning it was fine, but there was a thick mist almost all the way along the ridge. I got to Chakrata on the afternoon of July 21 in time to avoid a wetting. The coolies with the kit got caught in the evening storm: all the baggage was thoroughly soaked, and this the last march and the only occasion on which the baggage had got wet!

A few remarks as to supplies and arrangements may be welcomed. All usual supplies of the country, including Kerosine Oil, can be obtained at Roru, Sarahan, Nichar, Chini, and Rampur. At Chakrata *all* stores for the trip can be purchased; so nothing need be taken from the plains the same, of course, being the case if Simla is the place of departure.

A few tinned stores can be got from the Bungalow *khansamah* at Sarahan, which is the only place beyond Fagu, so far as I know, where there is a *khansamah*. Nearly all the Bungalows mentioned have cooking utensils and table kit which can be utilized by the traveller. The Divisional Forest Officer (Kotgarh P. O., Bashahr State) should be written to for permission to occupy the Rest Houses of the Forest Department, and the Executive Engineer, Hindustan-Tibet Road, Simla, should be addressed as to all other Bungalows on the road. 'Begar'—the obligatory carriage of baggage by the people of the country—has, I believe, been now abolished; but no doubt the necessary transport can be obtained. Pack mules could travel the whole distance, and could be hired at Chakrata or Simla. The Superintendent Simla Hill States should be written to as regards the proposed journey. The services of a State Tahsil chaprassi, if obtained, would smooth away many of the difficulties of travel.

And now comes the parting of the ways. Those among our readers who may be induced, by what I have so inadequately attempted to describe, to take a similar holiday amidst the grand scenery of the mighty Himalayas, will ever carry with them the memory of what they have seen: and, by the many photographs which they will doubtless secure will have such a record as will enable them, whenever they wish, to again 'take to the open road' and travel in vivid memory with the everchanging and magnificent scenery which was before them.

ON THE DOWN PLUMAGES OF SOME INDIAN BIRDS

BY

CLAUD B. TICEHURST, M.A., M.B.O.U. (Late Capt. R.A.M.C.)

(*With a plate*)

INTRODUCTION

In 1908 I described (*British Birds' Magazine*) the down plumages of some of the commoner British nidicolous birds, a study which up to that time had not been touched. During my stay in India I collected a fair number of notes on the down plumages of Indian birds, and these supplemented by notes and specimens sent me by Mr. H. Whistler, Mr. A. E. Jones, Col. Kinloch, Mr. Browne and others, form the subject of this paper. It is hoped that as the result of this preliminary paper and the appeal I have made through this Journal that much more material will be sent, so that a further instalment can be written on this neglected subject.

The young of birds when first hatched are either clothed with down and leave the nest almost at once (Nidifugous), or the down is comparatively scanty, until they can fly (Nidicolous). If nidifugous chicks have hitherto received but scant attention, nidicolous chicks have been entirely neglected by all naturalists.

Of how much value an exact knowledge of down plumages may be, cannot be at present said until we know these plumages in a good many genera and species, but it may be pointed out that the positions of some genera are so obscure that anything which may throw light on this subject would be welcome, and it is just at this age in a bird's life-history when lost affinities might be to well developed *rami* and close-set *radii*. So too the hair-like tips to down, revealed. Take for instance the *Crateropodidæ*—the ornithological 'waste paper basket' into which most genera that lacked an obvious niche were relegated—with its six sub-families and seventy-six genera (F.B.I. Ed. I, vol. i). Since the 'Fauna' was written, several genera have been removed entirely from this family on one ground or another, and I think it quite possible if one could but examine chicks of each of these seventy-six genera, one would find that some were in the wrong sub-family, or even did not belong to this family at all.

CHARACTER OF DOWN

In the newly hatched chick, down may be of two kinds :—

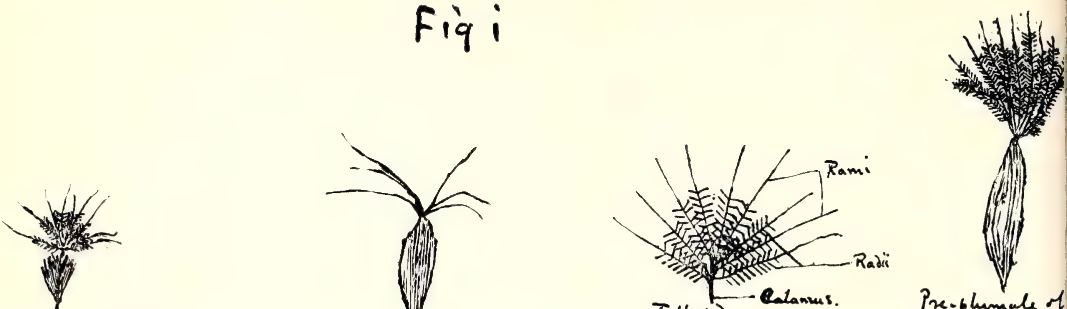
(1) *Prepennæ*, i.e., preceding and replaced by true feathers.

(2) *Preplumulæ*, i.e., preceding and replaced by adult 'under down'.

The two kinds are so similar in appearance that they can only be differentiated by examination of what is replacing them. (Fig. i *a* and *b*). Passerin. and many other orders have only prepennæ; Cormorants have only preplumulæ; Hawks have both, the latter making up the bulk of the down.

Though the down of various birds varies so much in appearance, (compare a Pigeon and a Wader), it is only a matter of degree of development of the constituent elements. These consist of (1) *calamus*, very short, (2) *rachis*, ill-defined or absent, (3) *rami* long, slender, variable in number, (4) *radii*, on each *ramus*, well developed to practically absent (Fig. i *c*). Thus the hair like down of Pigeons is due to few *rami* without *radii*, (Fig. *id*) and the softness and 'fluffiness' of the down of waders and compactness in sandgrouse is due to well developed *rami* and close-set *radii*. So too the hair-like tips to down, as in Herons, etc., is due to lack of radii at the extremities of the rami. The weak loose-looking down of *Passeres* is due to the sparseness of the down tufts composed of rather long slender rami with comparative short radii which do not reach to the tips of the rami.

Fig i



Down and Juvenile feather of a Passerine (Pyrrhulauda grisea)

A.

Down and Feather-bud. of. Streptopelia meena.

D

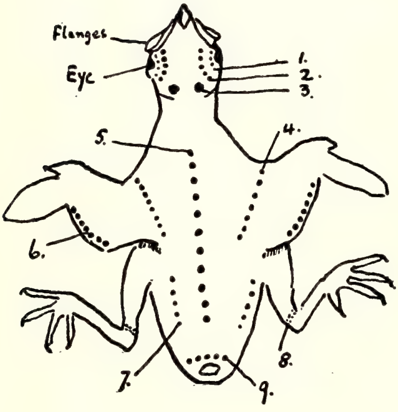
Tuft of Down. (Magnified)

C.

Pre-plumule of Aquila vindhy

B.

Fig ii

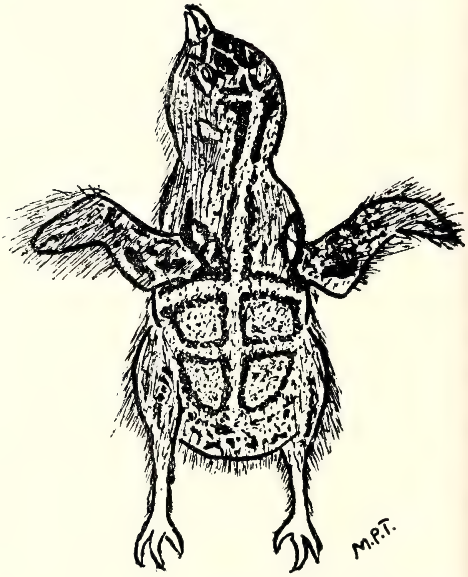


Down Tracks of a Passerine

1. Supercilieary.
2. Supraorbital.
3. Occipital.
4. Humeral
5. Spinal.
6. Ulnar
7. Femoral
8. Crural.
9. Uropygial.

(Ventral not shewn)

Fig iii



Downy Chick (Dorsal view) of Pterocles senegalensis (semidiagramatic) showing pattern of down.

DISTRIBUTION OF DOWN

In *Passeres,* when down is present, it is always distributed in definite tracks, which of course, correspond to subsequent feather tracks, though each feather track is not necessarily preceded by down. In *British Birds' Mag.*, vol. ii, pp. 186-8, I named these tracks according to their anatomical positions, and this nomenclature, I see no reason to alter (Fig. ii).

1. Outer-supraorbital or superciliary.
2. Inner supraorbital or supraorbital.
3. Occipital.
4. Humeral.
5. Spinal.
6. Ulnar.
7. Femoral.
8. Ventral.
9. Crural.

(10. Uropygial.)

In many Nidifugous birds, down appears to cover the whole body; in certain other birds (Herons, Hawks, Pigeons) down does not cover the entire body, but the tracks are not so simple as in *Passeres,* and their positions are not yet worked out.

It is noteworthy that, of these tracks, No. 1 is usually absent, and that 2, 3, 4, 5 usually present, 6 and 7 fairly often, 8 and 9 less often, and No. 10 only in one species.

Tongue Spots.—The meaning of tongue spots in newly hatched chicks is not clear; usually they consist of two oval spots at the base of the tongue, one on each side, and sometimes also at the tip. They appear to be well marked in Warblers and Larks only, and a trace in a few other species. They disappear as soon as the young are fledged.

REMARKS

1-3. **Corvidæ.** It is curious to find that there is no down in the Jungle Crow, British members of the genus *Corvus,* viz., *corax, corone, frugilegus, monedula,* have down present in varying amount; in *Garrulus glandarius* it is absent as also in *Pica pica.*

4-6. **Paridæ.** The distribution of down in *Parus major* is the same as in these two Indian species. As in *Æg, concinna* so in *Æg. caudata* down is absent.

8-14. **Turdoinæ.** It will be noted that the distribution in the two *Trochalopterum* is the same and in *Garrulax,* and *Pomatorhinus* is only slightly different. The total absence in *Argya, Pyctorhis* and *Stachyridopsis* is noteworthy—but specimens from more species and more genera are required before one can begin to generalize.

15. The sole *Brachypterygine* representative resembles *Trochalopterum* in down distribution, but here again more genera and species are required.

16-20. **Brachypodinæ.** Down seems to be absent in this group but one would like to see examples of more genera and species.

21-27. *Phylloscopus* and *Seicercus* in many ways are rather closely allied and also this is born out by the presence of, though reduced, down tracts. In species of *Sylvia, Acrocephalus, Hippolais, Cisticola, Prinia. Fanklinia* I have examined down is entirely absent. It is well marked however in *Locustella nævia.*

28-30. Down is absent also in the European *L. collurio* and *senator.*

32-34. Evidently quite a *sturnine* character are the large flanges of the gape. Much the same distribution of down also is seen in these genera. The crural and ventral tracks when only slightly marked as in *Acridotheres tristis* may be the subject of variation either individual or accidental; thus in other specimens of this species I have found no ventral or crural tracks but these were a nestful of chicks of varying ages and I think probably in this case loss of down tracks was accidental.

37-41.—The Fly-Catchers are split by some authors into many genera and lumped by others in a few genera; it is highly desirable therefore for more species of all the Indian genera to be examined to see if the down plumages can throw any light on how the Fly-Catchers should be grouped.

42-43. The similarity in the two *Saxicola* will be noted and the down distribution is the same in the English Stonechat and Whinchat.

ABBREVIATIONS.—Sh. = Short ; F.L. = fairly long ; L. = long ; V.L. = very long ; V.Sc. = very scanty ; Sc. = scanty ; F.P. = fairly plentiful ; P. = plentiful ; V.P. = very plentiful ; X. = track present.

—	Length	Amount	Colour	Superciliary	Supraorbital	Occipital	Humeral	Spinal	Ulnar	Femoral	Ventral	Crural	Tongue Spots	Remarks
1. *Corvus c. intermedius* ...						Absent							Nil	
2. *Garrulus lanceolatus* ...						,,							,,	
3. *Nucifraga hemispila* ...	Sh.	Sc.	White ...		X	X	X	X	X	X			,,	
4. *Parus c. kaschmiriensis* ...	,,	,,	Pale grey ...		X	X	X	X					,,	
5. *Parus melanolophus* ...	,,	,,	Dark grey ...		X	X	X	X					,,	
6. *Aegithaliscus c. iredalei*...						Absent							,,	
7. *Sitta c. castaneiventris* ...	Sh.	V.Sc.	Grey ...					X					,,	One tuft only.
8. *Garrulax albogularis* ...	F.L.	,,	White ...		X	X		X		X			,,	
9. *Trochalopterum l. lineatum.*	,,	F.P.	Dark grey ...		X	X	X	X		X			,,	
10. *Trochalopterum e. erythrocephalum.*	,,	,,	Buff grey ...		X	X	X	X		X			,,	
11. *Argya c. caudata* ...						Absent							,,	
12. *Pomatorhinus e. erythrogenys.*	V.L.	F.P.	Dark grey ...		X	X	X	X		X	X*		,,	* Slight. Bill short and straight.
13. *Pyctorhis sinensis* ...						Absent							X	
14. *Stachyridopsis pyrrhops* ...						,,							Nil	
15. *Leioptila c. pallida* ...	L.	F.P.	Pale grey-brown ...		X	X	X	X		X			,,	
16. ,, *p. psaroides* ...						Absent							,,	
17. *Pycnonotus h. hæmorrhous.*						,,							X?	A faint trace only.
18. *Pycnonotus h. intermedius*						,,							X	
19. *Pycnonotus l. leucogenys...*						,,							X	
20. *Otocompsa e. fuscicaudata.*						,,							X	
21. *Cisticola j. cursitans* ...						,,							X	
22. *Franklinia buchanani* ...						,,							X	

23.	*Cryptolopha x. xanthoschista*	Sh.	Sc.	Pale grey ...		×	×	×						Nil		
24.	*Phylloscopus affinis* ...	,,	,,	Dark grey ...		×	×							× ?		
25.	*Prinia g. lepida* ...					Absent								×		
26.	*Prinia s. stewarti* ...					,,								×		
27.	*Prinia i. inornata* ...					,,								×		
28.	*Lanius s. erythronotus* ...					,,								Nil		
29.	*Lanius s. tephronotus* ...					,,								,,		
30.	*Lanius vittatus* ...					,,								,,		
31.	*Oriolus o. kundoo* ...	Sh.	F.P.	White ...		×	×	×	×	×	×	×		,,	* Slight trace.	'Heel pads' present Flanges of gape large as in *Sturnus.*
32.	*Temenenuchus pagodarum*	,,	Sc.	,, ...		×	×	×	×	×	×*			,,		
33.	*Sturnopastor c. contra* ...	L.	F.P.	Grey ...		×	×	×	×	×	×	×*	×*	,,	,,	
34.	*Acridotheres t. tristis* ...	F.L.	,,	Grey-white ...		×	×	×	×	×	×	×*	×*	,,	,,	
35.	*Dicrurus m. macrocercus*...					Absent								,,		
36.	*Dicrurus l. longicaudatus.*															
37.	*Cyornis superciliaris* ...	F.L.	Sc.	Dark-brown ...		×	×	×	×		×*			Nil	* Slight.	
38.	*Stoparola m. melanops* ...	,,	F.P.	Brown-black ...		×	×	×	×					,,		
39.	*Alseonax l. poonensis* ...	Sh.	Sc.	Isabelline ...	×	×	×	×	×	×	×			,,		
40.	*Tchitrea paradisi* ...	,,	F.P.	Buff grey ...		×	×	×	×	×	×	×	×	,,		
41.	*Rhiphidura aureola* ...	F.L.	,,	Pale buff-grey ...		×	×	×	×	×	×	×		,,		
42.	*Saxicola c. bicolor* ...	,,	,,	Buff-grey ...		×	×	×	×					trace		
43.	*Saxicola t. indica* ...	L.	P.	Pale grey ...		×	×	×	×					Nil		
44.	*Enicurus m. guttatus* ...	,,	F.P.	Dark grey ...		×	×	×	×	×				,,		
45.	*Chaimarrhornis leucocephala.*	V.L.	Sc.	Sooty grey ...		×	×	×	×					,,		
46.	*Phœnicurus o. phœnicuroides.*	L.	P.	Dark brown ...	×	×	×	×	×					,,		
47.	*Phœnicurus frontalis* ...	V.L.	F.P.	Dark grey ...		×	×	×	×					,,		
48.	*Rhyacornis fuliginosus* ...	L.	,,	Pale red brown ...		×	×	×	×					,,		
49.	*Cyanosylvia s. abbotti* ...	F L.	,,	Black ...	×	×	×	×	×					trace		
50.	*Ianthia r. pallidior* ...	,,	Sc.	Pale smoke ...		×	×	×	×					Nil		
51.	*Thamnobia f. cambayensis.*													?		
52.	*Copsychus s. saularis* ...													Nil		
53.	*Turdus boulboul* ...	Sh.	F.P.	Pale isabell ...		×	×	×	×	×				,,		
54.	*Turdus v. bonapartei* ...	F.L.	,,	Whitish ...		×	×	×	×	×				,,		

ABBREVIATIONS.—Sh. = Short; F.L. = fairly long; L. = long; V.L. = very long; V.Sc. = very scanty; Sc. = scanty; F.P. = fairly plentiful; P. = plentiful; V.P. = very plentiful; X. = track present.

——	Length	Amount	Colour	Superciliary	Supraorbital	Occipital	Humeral	Spinal	Ulnar	Femoral	Ventral	Crural	Tongue Spots	Remarks
1. *Corvus c. intermedius*						Absent							Nil	
2. *Garrulus lanceolatus*						,,							,,	
3. *Nucifraga hemispila*	Sh.	Sc.	White		X	X	X	X	X	X			,,	
4. *Parus c. kaschmiriensis*	,,	,,	Pale grey		X	X	X	X					,,	
5. *Parus melanolophus*	,,	,,	Dark grey		X	X	X	X					,,	
6. *Aegithaliscus c. iredalei*						Absent							,,	
7. *Sitta c. castaneiventris*	Sh.	V.Sc.	Grey					X					,,	One tuft only.
8. *Garrulax albogularis*	F.L.	,,	White		X	X		X		X			,,	
9. *Trochalopterum l. lineatum.*	,,	F.P.	Dark grey		X	X	X	X		X			,,	
10. *Trochalopterum e. erythrocephalum.*	,,	,,	Buff grey		X	X	X	X		X			,,	
11. *Argya c. caudata*						Absent							,,	
12. *Pomatorhinus e. erythrogenys.*	V.L.	F.P.	Dark grey		X	X	X	X		X	X*		,,	* Slight. Bill short and straight.
13. *Pyctorhis sinensis*						Absent							X	
14. *Stachyridopsis pyrrhops*						,,							Nil	
15. *Leioptila c. pallida*	L.	F.P.	Pale grey-brown		X	X	X	X		X			,,	
16. ,, *p. psaroides*						Absent							,,	
17. *Pycnonotus h. hæmorrhous.*						,,							X?	A faint trace only.
18. *Pycnonotus h. intermedius*						,,							X	
19. *Pycnonotus l. leucogenys*						,,							X	
20. *Otocompsa e. fuscicaudata.*						,,							X	
21. *Cisticola j. cursitans*						,,							X	
22. *Franklinia buchanani*						,,							X	
23. *Cryptolopha x. xanthoschista.*	Sh.	Sc.	Pale grey		X	X	X						Nil	
24. *Phylloscopus affinis*	,,	,,	Dark grey		X	X							X ?	
25. *Prinia g. lepida*						Absent							X	
26. *Prinia s. stewarti*						,,							X	
27. *Prinia i. inornata*						,,							X	
28. *Lanius s. erythronotus*						,,							Nil	
29. *Lanius s. tephronotus*						,,							,,	
30. *Lanius vittatus*						,,							,,	
31. *Oriolus o. kundoo*	Sh.	F.P.	White		X	X	X	X	X	X	X		,,	
32. *Temenenuchus pagodarum*	,,	Sc.	,,		X	X	X	X	X	X*			,,	* Slight trace. 'Heel pads' present Flanges of gape large as in *Sturnus.*
33. *Sturnopastor c. contra*	L.	F.P.	Grey		X	X	X	X	X	X	X*	X*	,,	,,
34. *Acridotheres t. tristis*	F.L.	,,	Grey-white		X	X	X	X	X	X	X*	X*	,,	,,
35. *Dicrurus m. macrocercus*						Absent							,,	
36. *Dicrurus l. longicaudatus.*														
37. *Cyornis superciliaris*	F.L.	Sc.	Dark-brown		X	X	X	X		X*			Nil	* Slight.
38. *Stoparola m. melanops*	,,	F.P.	Brown-black		X	X	X	X					,,	
39. *Alseonax l. poonensis*	Sh.	Sc.	Isabelline	X	X	X	X	X	X	X			,,	
40. *Tchitrea paradisi*	,,	F.P.	Buff grey		X	X	X	X	X	X	X	X	,,	
41. *Rhiphidura aureola*	F.L.	,,	Pale buff-grey		X	X	X	X	X	X	X		,,	
42. *Saxicola c. bicolor*	,,	,,	Buff-grey		X	X	X	X					trace	
43. *Saxicola t. indica*	L.	P.	Pale grey		X	X	X	X					Nil	
44. *Enicurus m. guttatus*	,,	F.P.	Dark grey		X	X	X	X	X				,,	
45. *Chaimarrhornis leucocephala.*	V.L.	Sc.	Sooty grey		X	X	X	X					,,	
46. *Phœnicurus o. phœnicuroides.*	L.	P.	Dark brown	X	X	X	X	X					,,	
47. *Phœnicurus frontalis*	V.L.	F.P.	Dark grey		X	X	X	X					,,	
48. *Rhyacornis fuliginosus*	L.	,,	Pale red brown		X	X	X	X					,,	
49. *Cyanosylvia s. abbotti*	F L.	,,	Black	X	X	X	X	X					trace	
50. *Ianthia r. pallidior*	,,	Sc.	Pale smoke		X	X	X	X					Nil	
51. *Thamnobia f. cambayensis.*													?	
52. *Copsychus s. saularis*													Nil	
53. *Turdus boulboul*	Sh.	F.P.	Pale isabell		X	X	X	X	X				,,	
54. *Turdus v. bonapartei*	F.L.	,,	Whitish		X	X	X	X	X				,,	

——	Length	Amount	Colour	Superciliary	Supraorbital	Occipital	Humeral	Spinal	Ulnar	Femoral	Ventral	Crural	Tongue spots	Remarks
55. *Monticola solitarius* ...	F.L.	F.P.	Dark grey ...		×	×	×	×					Nil.	
56. *Monticola cinclorhyncha*...	,,	P.	Rufous-buff ...		×	×	×	×					,,	
57. *Myophoneus temminckii* ...	V.L.	,,	Dark grey-brown ...	×	×	×	×	×	×	×			,,	
58. *Laiscopus c. whymperi* ...	F.L.	F.P.	Black ...		×	×	×	×	?	×			×	Spec. rather old. Bill bright pink, mouth bright orange, flanges white.
59. *Prunella rubeculoides* ...	,,	,,	Grey-brown ...		×	×	×	×	×	×			×	
60. *Ploceus p. philippinus* ...	,,	,,	White ...		×	×	×	×	×	×	×		Nil.	
61. *Ploceus m. flaviceps* ...	,,	,,	,, ...		×	×	×	×	×	×			,,	
62. *Uroloncha malabarica* ...	Sh.	V. Sc	,, ...					×					×	
63. *Uroloncha p. punctulata*...	,,	Sc.	,, ...				×	×					×	
64. *Serinus pusillus* ...	,,	F.P.	Pale grey ...		×	×	×	×	×	×	×*		Nil.	* Slight.
65. *Gymnorhis x. xanthocollis*													,,	
66. *Passer d. indicus* ...													,,	
67. *Passer pyrrhonotus* ...													,,	
68. *Montifringilla n. adamsi*..	F.L.	Sc.	Grey-white ...		×	×	×	×	×*				,,	* Slight.
69 *Emberiza c. stracheyi* ...	,,	F.P.	Dark grey ...		×	×	×	×	×	×	×	×	,,	
70. *Riparia chinensis* ...	,,	,,	White ...		×	×	×	×					,,	
71. *Hirundo d. erythropygia*...	,,	Sc.	Pale grey ...		×	×	×	×		×			,,	
72. *Hirundo r. javanica* ...	Sh.	P.	Pale brown ...		×	×	×	×		×			,,	
73. *Hirundo s. filifera* ...	,,	Sc.	Dark grey ...		×	×	×	×					,,	
74. *Motacilla c. melanope* ...	L.	P.	Dirty white ..		×	×	×	×	×	×			Trce	
75. *Motacilla c. calcarata* ...	F.L.	F.P.	Yellow white ...		×	×	×	×	×				Nil.	
76. *Anthus s. jerdoni* ...	L.	P.	Pale grey ...	×	×	×	×	×	×	×	×*	×	,,	* Scanty.
77. *Anthus roseatus* ...	F.L.	F.P.	Grey ...	×	×	×	×	×	×	×*	×	×*	,,	* Scanty.
78. *Anthus rufulus* ...	,,	P.	Pale grey ...	×	×	×	×	×	×	×	×	×	,,	

79.	*Alæmon alaudipes* ...	V.L.	V.P.	Buff-white ...		×	×	×	×	×	×			?	
80.	*Otocorys a. longirostris*...	Sh.	F.P.	Cream ...		×	×	×	×	×	×			×	
81.	*Alauda g. guttata* ..	,,	,,	Buff and brown ...		×	×	×	×	×	×			×	
82	*Galerida c. chendoola* ...	L.	,,	Whitish ...		×	×	×	×*	×	×			×	* Down to base of uropygium.
83.	*Calandrella r. adamsi* ...	,,	,,	Whitish ...		×	×	×	×	×	×	×*		×	* Scanty.
84.	*Mirafra assamica* ...	F.L	,,	Buff ...		×	×	×	×	×	×	?		×	Rather old specimens.
85	*Pyrrhulauda grisea* ...	,,	,,	Buff-white ...		×	×	×	×	×	×	?		?	
86.	*Zosterops palpebrosa* ...	Sh.	Sc.	White ...		×								×	
87.	*Cinnyris a. brevirostris*...					Absent.								Nil.	
88.	*Cinnyris a. asiatica* ...													,,	
89.	*Dicæum erythrorhynchum*													,,	
90.	*Picus occipitalis* ...					Absent.								,,	Tubercular 'heel pads' present.
91.	*Dryobates auriceps* ..													,,	,, ,, ,,
92.	*Brachypternus delutus* ...													,,	,, ,, ,,
93.	*Cyanops asiatica* ...													,,	Spiny ,, ,,
94.	*Cyanops flavifrons* ...													,,	,, ,, ,,
95.	*Coracias bengalensis* ...													,,	Tubercular ,,
96.	*Merops persicus* ...													,,	No 'heel pads'
97.	*Merops javanicus* ...													,,	,,
98.	*Halcyon smyrnensis* ...													,,	Tubercular 'heel pads' present.
99.	*Upupa e. nigripennis* ...	V.L.	P.	White ...		×	×	×	×		×		×	,,	Down also on uropygial. No 'heel pads.'
100.	*Micropus a. galilejensis*..					Absent.								,,	,, ,,
101.	*Conurus torquatus* ...													,,	Tubercular 'heel pads' present.
102.	*Conurus cyanocephalus* ...													,,	,, ,, ,,
103.	*Cuculus canorus* ...													,,	No 'heel pads.'

	——	Length	Amount	Colour	Superciliary	Supraorbital	Occipital	Humeral	Spinal	Ulnar	Femoral	Ventral	Crural	Tongue spots	Remarks
55.	*Monticola solitarius*	F.L.	F.P.	Dark grey		×	×	×	×					Nil.	
56.	*Monticola cinclorhyncha*	,,	P.	Rufous-buff		×	×	×	×					,,	
57.	*Myophoneus temminckii*	V.L.	,,	Dark grey-brown	×	×	×	×	×	×	×			,,	
58.	*Laiscopus c. whymperi*	F.L.	F.P.	Black		×	×	×	×	?	×			×	Spec. rather old. Bill bright pink, mouth bright orange, flanges white.
59.	*Prunella rubeculoides*	,,	,,	Grey-brown		×	×	×	×	×	×			×	
60.	*Ploceus p. philippinus*	,,	,,	White		×	×	×	×	×	×	×		Nil.	
61.	*Ploceus m. flaviceps*	,,	,,	,,		×	×	×	×	×	×			,,	
62.	*Uroloncha malabarica*	Sh.	V. Sc	,,					×					×	
63.	*Uroloncha p. punctulata*	,,	Sc.	,,				×	×					×	
64.	*Serinus pusillus*	,,	F.P.	Pale grey		×	×	×	×	×	×	×*		Nil.	* Slight.
65.	*Gymnorhis x. xanthocollis*													,,	
66.	*Passer d. indicus*													,,	
67.	*Passer pyrrhonotus*													,,	
68.	*Montifringilla n. adamsi*	F.L.	Sc.	Grey-white		×	×	×	×	×*				,,	* Slight.
69	*Emberiza c. stracheyi*	,,	F.P.	Dark grey		×	×	×	×	×	×	×	×	,,	
70.	*Riparia chinensis*	,,	,,	White		×	×	×	×					,,	
71.	*Hirundo d. erythropygia*	,,	Sc.	Pale grey		×	×	×	×		×			,,	
72.	*Hirundo r. javanica*	Sh.	P.	Pale brown		×	×	×	×		×			,,	
73.	*Hirundo s. filifera*	,,	Sc.	Dark grey		×	×	×	×					,,	
74.	*Motacilla c. melanope*	L.	P.	Dirty white		×	×	×	×	×	×			Trce	
75.	*Motacilla c. calcarata*	F.L.	F.P.	Yellow white		×	×	×	×	×				Nil.	
76.	*Anthus s. jerdoni*	L.	P.	Pale grey	×	×	×	×	×	×	×	×*	×	,,	* Scanty.
77.	*Anthus roseatus*	F.L	F.P.	Grey	×	×	×	×	×	×	×*	×	×*	,,	* Scanty.
78.	*Anthus rufulus*	,,	P.	Pale grey	×	×	×	×	×	×	×	×	×	,,	
79.	*Alæmon alaudipes*	V.L.	V.P.	Buff-white		×	×	×	×	×	×			?	
80.	*Otocorys a. longirostris*	Sh.	F.P.	Cream		×	×	×	×	×	×			×	
81.	*Alauda g. guttata*	,,	,,	Buff and brown		×	×	×	×	×	×			×	
82	*Galerida c. chendoola*	L.	,,	Whitish		×	×	×	×*	×	×			×	* Down to base of uropygium.
83.	*Calandrella r. adamsi*	,,	,,	Whitish		×	×	×	×	×	×	×*		×	* Scanty.
84.	*Mirafra assamica*	F.L	,,	Buff		×	×	×	×	×	×	?		×	Rather old specimens.
85	*Pyrrhulauda grisea*	,,	,,	Buff-white		×	×	×	×	×	×	?		?	
86.	*Zosterops palpebrosa*	Sh.	Sc.	White		×								×	
87.	*Cinnyris a. brevirostris*						Absent.							Nil.	
88.	*Cinnyris a. asiatica*													,,	
89.	*Dicæum erythrorhynchum*													,,	
90.	*Picus occipitalis*						Absent.							,,	Tubercular 'heel pads' present.
91.	*Dryobates auriceps*													,,	,, ,, ,,
92.	*Brachypternus delutus*													,,	,, ,, ,,
93.	*Cyanops asiatica*													,,	Spiny ,, ,,
94.	*Cyanops flavifrons*													,,	,, ,, ,,
95.	*Coracias bengalensis*													,,	Tubercular ,,
96.	*Merops persicus*													,,	No 'heel pads'
97.	*Merops javanicus*													,,	,,
98.	*Halcyon smyrnensis*													,,	Tubercular 'heel pads' present.
99.	*Upupa e. nigripennis*	V.L.	P.	White		×	×	×	×		×		×	,,	Down also on uropygial. No 'heel pads.'
100.	*Micropus a. galilejensis*						Absent.							,,	,, ,,
101.	*Conurus torquatus*													,,	Tubercular 'heel pads' present.
102.	*Conurus cyanocephalus*													,,	,, ,, ,,
103.	*Cuculus canorus*													,,	No 'heel pads.'

45-50. The uniformity of down distribution in this group is interesting; the presence or absence of the superciliary track is a feature on which not too much stress can be laid as I know in some species it varies in individuals. *Ph. phœnicurus* has the same distribution as that of *phœnicuroides* and *Erithacus rubecula* is the same as in *Cyanosylvia suecica*—a near ally. The colour of most passerine down is 'neutral'—a grey, brown, black or white—a distinct red-brown as in *Rhyacornis* is a most unusual colour.

51-52. Is it certain that *Thamnobia* and *Copsychus* are *Ruticilline* or even belong to the *Turdidæ?* If so they are most aberrant. They are the only species examined among this family which lack down; their juvenile plumage has not the well marked spotted appearance of Redstarts or Thrushes. They are most remarkable in having when hatched a *black* skin, a condition I have not seen in any other of the *Turdidæ;* moreover, *Copsychus* at all events, has a complete post-juvenile moult which none of the *Turdidæ,* so far as I know, have.

53-54. *T. merula, philomelos, pilaris* and *viscivorus* all have the same down distribution as these two Thrushes. The absence of the ulnar track in *Monticola* may be a characteristic as opposed to Turdus.

58-59. The down in *P. modularis* is the same as in these. The mouth colours in *L. collaris* is remarkable.

60-63. The great reduction in tracks in *Uroloncha* (*Viduinæ*) is noteworthy as compared with the *Ploceinæ;* as also are the mouth colours of *Uroloncha.* The palate and floor of the mouth is yellow (*malabarica*) whitish (*punctulata*) outlined with black, and the base and tip of the tongue is also black. Similar mouths are found in African *Viduinæ* (Cf. Ibis 1916, p. 275).

65-67. The total absence of down in *Passer* and *Gymnorhis* is curious as other finches are well supplied with down. The Sparrows might well stand as a sub-family *Passerinæ* since they have also other peculiarities.

69. Buntings would seem always to have 'full' track; the same distribution is found in *E. schœinclus* and *citrinella.*

74-75. In the Wagtails the superciliary, femoral and crural tracks appear to be variable in the different species and in individuals; thus. *M. yarrelli* has these tracks present in addition to the others. In a nest-full of chicks of *M. flava thunbergi* (Norway) which I examined, the superciliary was absent and the femoral and crural were present, though scanty, in some but not in others, the distribution otherwise was as in *calcarata.*

76-78. The distribution in *Anthus* is remarkably uniform; the English *Anthus trivialis, pratensis* and *obscurus* have also the same tracks present.

79-85. Here again in the *Alaudidæ* there is a remarkable uniformity; it is interesting to note that *Alæmon,* which in many ways has diverged from the 'typical' Lark, retains the typical Alaudine down distribution, which surely suggests that this character is an archaic one and should be of value; the long legs and bill and aberrant nesting habits are adaptations. The down in *Alæmon* is remarkably long and plentiful, and the chicks are said to leave the nest and run before they can fly, the only instance I can recall of a nidicolous bird tending to become nidifugous. It would be interesting to know on what day the young do leave the nest.

The down in *Alauda gulgula* (and in *arvensis*) is grizzled, that is, of two colours; in all the other species of genera examined it is unicolorous.

90-103. Heelpads, tuberculated or spiny pads under the tarso-metatarsal joint, must I think be associated with 'hole-breeding', and help to balance the body on the metatarsus and feet; yet it is absent in *Merops* and *Upupa.* These pads disappear after the young are fledged. Note the presence of slight pads in *Temenuchus pagodarum* which frequently nests in old Wood-pecker holes, and the absence in the other Mynahs examined.

(For further notes on 'heelpads', see Chasen.)

104. **Caprimulgus e. unwini.** General colour pale isabelline, paler than in *europæus;* dark spots on head, wings and thighs black not brown as in *europæus.* Almost completely clothed with down.

105. **Caprimulgus mahrattensis.** General colour whitish-isabelline and so rather paler than *unwini;* dark marks less pronounced, but in the same positions, than in *unwini.*

106. **Glaucidium cuculoides.** Clothed with short white down all over when first hatched.

107. **Bubo coromandus.** No tracks. Almost entirely covered with short, pure white down when first hatched.

108. **Otogyps calvus.** Crown from level of eyes and nape clothed with short, close grey-white down, centre of chin and throat sparsely tufted same; crop with thicker buff tinged down; sides of breast and flanks longer pale buff down; rest of upper parts, grey-white. Bare skin of face and upper parts of head and cere pale bluish-lead colour in contrast to skin of throat, chin and neck, which is pinkish-lead. A bare ring 1¼ in. wide round neck from nape bare with longitudinal flaps of loose skin, a prominent one on each side being probably the origin of the adult wattles. (*H. Whistler*).

109. **Pseudogyps bengalensis.** Down covers whole body except a track from base of neck broadening to vent. Down of head and neck shorter than the rest. Mouse-grey in colour except darker patches to the uropygium and along ulnar border. Cere and base patch round eye blue-lead.

110. **Milvus m. govinda.** Plentiful. Long. No tongue spots; cere and gape livid grey; general colour whitish, tinged with buff; eyelids, dark mark in front of and behind eye, along radius of wing and down both sides of spine coalescing in the middle, sooty brown.

111. **Falco jugger.** Fairly long, dull white. Whole body covered except in definite places (=Apterion). Whole head covered, and down continuous thence down hind neck to spinal track, which spreads out over back of thighs and is continuous with lateral ventral tracks. Between the spinal and humeral tracks, an apterion with sparse short tufts of down. From the chin run two ventral neck tracks, separated by apteria from the dorsal neck track and from each other, which at the top of the sternum, divide into lateral and median sternal tracks, the apteria between them having scanty, short tufts; apterion in centre of abdomen, rest covered with sparse down continuous with dorsal track laterally. Upper surface of wing except *manus,* clothed with long down, under surface, four rows of short down. Thumb with distinct claw.

112. **Butastur teesa.** Prepennæ and preplumulæ both present.

Prepennæ, fairly long and plentiful over the whole body; white above, tinged with isabelline at tips; white below.

Preplumulæ; short, tufted, white.

Bill bluish, black at tip; cere and legs yellow, claws slate; iris dark brown.

113. **Aqila rapax vindhiana.** Prepennæ and preplumulæ present—white, sparse on cere and round orbit otherwise completely covering body. Preplumulæ makes up the bulk of down.

Bill, dull black, cere gape and legs yellow. Iris bluish-brown.

114. **Crocopus.** Long, plentiful, hair-like. Whitish.

115. **Streptopelia o. meena.** Long, plentiful, hair-like, yellowish-white. Whole body covered except sides of head, centre of abdomen and breast, chin and upper throat. Distribution and character is as in *Columbæ.*

116. **Streptopelia suratensis.** Long, plentiful, hair-like, rather darker than in *meena.*

117. **Pterocles senegalensis.** General colour above golden brown with black tips, and creamy-white. A more definite pattern than in *alchata.* A whitish line from base of bill passes over the head as a coronal streak (broken on forehead) to hind neck and then to middle of the back where it divides, making the top of a 'figure of eight'. From base of bill another white streak passes in front of eyes, and is lost in the ear coverts. Well marked 'figure of eight' on lower back outlined by black and enclosing brown down. Rest of crown pale ginger brown dotted with black; underparts buffish white, darkest on the pectoral region; bill and bare space round eyes, lead-blue; iris hazel; feet dusky-flesh, nails white. (See Fig. iii).

118. **Pterocles senegallus.** General colour above very pale sandy yellow, much paler than in *senegalensis* or *alchata,* with black tips to the down tufts, which on the head are not well marked except above the eyes; area round eyes pale ginger-brown. Underparts very pale isabelline; down pattern less variegated than in *senegalensis* and *alchata.*

119. **Pterocles alchatus caudacutus.** General colour above mottled very pale buffy-white, pale-ginger with black tips. No definite pattern, but supercilia and coronal streak whitish. The brown down here and there has long black, hair-like tips, while on the thighs, the whitish down has similar white hairs. Underparts, whitish to buffish-white.

120. **Gallus g. gallus.** From base of bill through eyes and down sides of neck, a black line; over this a broad line of pale buffish-brown; from base of comb down crown, neck, and dorsum to tail, a broad black line outlined on dorsum by a creamy streak on each side; wings chestnut; breast and thighs pale buffish-brown; rest of underparts creamy-white.

121. **Tragopan satyra.** Side of head and supercilium dirty buffish-white, dark tipped on ear-coverts; crown from bill ferruginous; upper parts ferruginous-brown with darker tips and paler bases, but no distinct pattern; tail ferruginous; chin and throat buffish-white; rest of underparts same, with faint dark tips and tinged with rust on sides and on thighs.

122. **Perdicula asiatica.** From base of bill over crown, down centre of back to tail, a broad chestnut band edged on each side with dark brown; outside this from base of bill a broad ochraceous supra-orbital stripe reaching nape and surmounting a narrow dark brown superciliary stripe; ear-coverts and short moustachial streak dark brown. Rest of upper parts dappled rusty brown and light; underparts ochraceous-grey.

123. **Francolinus francolinus.** Upper parts pale creamy-buff, from base of bill down centre of crown a broad chocolate-brown line, a short narrow line behind eyes, and a long, narrow one over the eyes and one from base of bill below the eyes, brown; three broad parallel brown lines on dorsum, and a broken one over thighs; underparts cream white; wings creamy-buff, mottled with brown.

N.B.—The description is taken from a chick of *arabistanicus,* the markings on the hill race (*melanonotus*) are similar, but the whole coloration is so much darker that one would hardly suppose the two to belong to the same species. It would be very interesting to see what the chick of the Plain bird (*asiæ*) is like; likewise the chicks of the various races of *pondicerianus.*

124. **Alectoris græca chukar.** A broad band from bill over crown to nape chestnut outlined in dark brown; from base of bill, a broad creamy white superciliary streak surmounting a narrow dark brown one; on the dorsum a broad median chestnut band and on each side of it a narrow creamy white streak; wings and back of thighs girgled brown and cream; underparts creamy grey, a short dark brown moustachial streak from base of bill.

125. **Tetraogallus himalayensis.** Upper parts stone-grey richly variegated, with black tips and subterminal pale-buff markings, making no definite pattern. Head, very pale creamy buff, tipped with black, and having four black lines from base of bill (1) along the side of the crown, (2) over the eye, (3) beneath the eye and (4) as moustachial streak, all more or less blending behind the eye and ear coverts. Underparts white, greyish-white on breast and flanks. Feet and legs, horny-yellow, bill black, iris olive-brown.

126. **Esacus recurvirostris.** Covered with close 'furry' down.
Narrow frontal band and line to eye, under eye and thence to occiput black; broken black lines on each side of spine, meeting at level of thighs and sending transverse bar to base of wings, black; short black line over thighs; rest of upper parts 'pepper and salt' colour, finely dotted with black. Underparts white.

127. **Cursorius coromandelicus.** Whole head, wings and upper-parts mottled ginger, creamy-white and black with no definite pattern. Underparts, creamy-white, pectoral region ginger; legs greyish.

128. **Glareola p. pratincola.** Head, wings and back grizzled dark brown and pale buff with median dark line down crown; underparts pale buff.

129. **Glareola lactea.** Whole of upper parts finely mottled greyish-white, dusky, and pale buff, narrow black line behind eyes; underparts white.

130. **Charadrius a. alexandrinus.** Forehead and carpus white; black line on forearm and behind each eye; white hind-collar; crown and rest of upperparts mottled black and buffish-white; underparts white.

131. **Charadrius dubius jerdoni.** Forehead, carpus, edge of ulnar and collar of hind neck white; circle round crown from eye to eye and above white collar, black; lines on thighs and forearm, tail, black; rest of upperparts grizzled black, white and ginger points.

132. **Charadrius mongolus atrifrons.** Upper parts deeper buff than in *alexandrinus,* mottled with black on crown; wings and whole of back, tips of wings and collar of neck grey-buff; narrow, short black lines on lores, behind eyes and on the ear coverts. Underparts white, grey-bluff at the sides; legs and feet plumbeous.

133. **Himantopus himantopus.** Head and upper parts mottled pale buff and black; black spinal line; black line from base of bill to eye, and on ulnar. Round eye and whole of underparts pale buff.

134. **Dromas ardeola.** Entirely covered with long, very pale smoke-grey down, darker on forehead and round eyes. Legs slate-grey.

(*N.B.*—The character of the down is more *Larine* than *Limicoline,* and lacks the mottling and lines which the latter nearly always shew.)

135. **Ibidorhynchus struthersi.** Upper parts mottled white, buff and black, underparts white. Bill straight. (*N.B.*—This is such a very poor specimen that details of pattern, etc., cannot be made out.)

136. **Lobivanellus indicus.** Upper parts grey brown mottled with black; behind eyes and round occiput a broad black collar, under this from below eyes, a broad white collar. Pectoral band black; chin and rest of underparts white, tinged with buff on belly and flanks.

137. **Scolopax rusticola.** From base of bill to eye, over and behind it, a narrow, dark brown line, from centre of base of bill to centre of crown, a dark brown line; between the two lines, creamy-yellow; rest of crown pale chestnut; side of head variegated, chestnut and creamy-yellow, as are the wings and rest of upper parts, shewing a broken spinal brown streak; underparts creamy-yellow tinged with ferruginous on throat and thighs.

138. **Larus gelastes.** Head, sides of head, upper parts, wings and thighs, evenly mottled with about equal areas of black and white alternating; underparts more white but black spots across lower throat and on sides of breast and flanks.

139. **Sterna caspia.** Like *nilotica,* but much fewer spots on crown and dorsum, and none behind the eyes.

140. **Sterna nilotica.** Upper parts dirty grey-buff with black spots on crown, behind eyes and on the dorsum where they tend to form stripes; carpus white, throat dusky to blackish, rest of underparts, nearly white.

141. **Sterna b. bengalensis.** Upper parts almost white with black spots on crown and ulnar, and tending to run into lines on the back. Underparts pure white.

142. **Sterna albifrons saundersi.** General colour more buffish than *melanogaster,* and more mottled with black; warmer buff than *a. albifrons;* underparts nearly white. Legs flesh.

143. **Sterna melanogaster.** Upper parts cream; broken line of black from base of bill on each side of crown and down dorsum; rest of upper parts spotted with black except wings; underparts cream-coloured.

144. **Egretta garzetta.** Long, plentiful, nearly white.

145. **Bubulcus coromandus.** Whole crown white, down 20 mm. long; short white down on ear-coverts and sides of neck; dorsum grey-white, underparts white. The down is distributed in definite tracks, but further specimens are required to make out the details. Down longer in some tracks than others. Iris, pale straw, facial skin, yellowish-green.

146. **Ardeola grayi.** Less long than in *garzetta,* nape and dorsum ruddy-buff, crown white or buffish-white, rest white.

147. **Megalornis antigone.** Entirely covered. Head, neck and throat pale isabelline; lower neck sides of breast and belly, vent and thighs darker isabelline; centre of breast and belly white from base of hind neck two broad lines of dark brown, enclosing a paler brown median stripe, run to tail; large buffish-white spot opposite base of both wings; wings cinnamon-brown, tip buffish-white.

148. **Megalornis leucogeranus.** Entirely covered. Underparts dirty buff, belly white. Head and neck dark isabelline; creamy streak on each scapular, rest of upper parts pale chestnut, darker on mid-dorsum (captivity bred).

In a former number of the Journal I made an appeal to members to supply me with material and I again appeal to them. My opportunities of getting such myself are *nil,*—I must rely on those still in India. I hope I have shewn that, apart from the fact that the down plumages of many Indian birds are still quite unknown, there may be learnt from them some information of important character and taxonomic value.

In order to help in this research members *need not be skilled ornithologists;* all that is required is that a chick fairly recently hatched (or even an egg on hatching point) shall be *labelled with the name of the species, wrapt in linen, and put into spirit or weak formalin;* at the end of the nesting season the bottle or tin may be sent to The Honorary Secretary, Bombay Natural History Society, 6 Apollo Street, Bombay, who has kindly offered to see to the despatching to England.

BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA, BURMA AND CEYLON

REPORT NO. 40

BY MRS. HELEN M. LINDSAY

(*With Field Notes by the Collectors*)

COLLECTION ...	... No. 40.
LOCALITY ...	... Gwalior State.
DATE ...	... June–December 1922.
COLLECTED BY ...	... Messrs. C. Primrose and J. R. O'Brien.

This collection is the continuation of that commenced in July 1914 by Major E. W. Mayor to represent the fauna of the Gwalior State in Central India. This was interrupted by the outbreak of war, but the few specimens then obtained were described in Report No. 21.

Report No. 7, also deals with specimens from Central India and describes in detail the nature of the country in that area. Gwalior State in the main shows the same features as those described for the districts of Damoh and Saugor in that report.

Gwalior State extends from 22° 10′–27° N. Latitude and from 74° 38′–79° 8′ Longitude. It forms three natural divisions :—

1. PLAIN represented in this collection by the localities Sheopur, Sabalgarh and Morar visited by Mr. Primrose and Guna visited by Mr. O'Brien. Its rainfall is 40 inches. The hot season is oppressive and the cold in winter severe.
2. PLATEAU represented by Agar Malwa whence at 1,500′ specimens were obtained by Mr. O'Brien. Its rainfall is 30 inches. The climate is comparatively equable, being free from extremes.
3. HILLS. This area is in the extreme south-west of the State but does not seem to have been visited by the collectors. Anjhera Zilla is its centre. It is covered with thick jungle.

The geological formation of Gwalior State resembles that described for Damoh and Saugor districts in Report No. 7.

Gwalior proper is largely occupied by the Vindhyan series with four principal ranges capped by massive beds of standstone which form the chief mineral product of the State.

In the south sections the formation is also sandstone, but with fossil beds in a series of calcareous strata along with extensive outcrops of gneissose rocks. The rest of the area is Deccan trap. The best soil is found in the Malwa part of the State, but the part round Bhind is covered with alluvial soil of fair fertility. Guna is the chief centre for the sale of grain. The principal crop of the State is Jowar (Great Millet).

In the north the vegetation in waste tracts consists largely of deciduous trees and shrubs, many of which flower when leafless during the hot season. Further south the low hills are covered with jungle, and Bamboos abound in places. The typical forest of the Central Indian Highlands is found in the extreme south.

As noted in Report No. 7, the fauna is of the same general type as that of Nimar and the Berars. But in the Gwalior collection there are no deer, monkeys or otters and only one species of Hare and one Antelope were obtained. Again the absence of Tree Shrews (Anathana) is to be recorded.

The present collection numbers 898 specimens belonging to 27 genera.

(1) PTEROPUS GIGANTEUS, Bruenn

The Common Flying Fox

(Synonymy in No. 2.)

Morar, ♂ 2 ; Bhind, ♂ 2 ; Sabalgarh, ♂ 8, ♀ 4 ; Sheopore, ♂ 1, ♀ 1 ; Guna, 1,564′, ♂ 1, ♀ 4 ; Chachora, 1,681′, ♂ 7 ; Agar Malwa, ♂ 2, ♀ 1.

(2) HIPPOSIDEROS FULVUS PALLIDUS, K. And.

The Bicoloured Leaf-nosed Bat

(Synonymy in No. 2.)

Sheopore, ♂ 1, ♀ 1.

(3) LYRODERMA LYRA, Geoff.

The Indian Vampire Bat

(Synonymy in No. 1.)

Bhind, ♂ 6, ♀ 6; Sheopore, ♀ 1; Chachora Fort, 1,681′, ♂ 30, ♀ 16; Agar Malwa, ♂ 3, ♀ 1.

(4) PIPISTRELLUS MIMUS, Wroug.

The Southern Dwarf Pipistrelle

(Synonymy in No. 1.)

Guna, 1,564′, ♂ 1.

(5) PIPISTRELLUS BABU, Thos.

The Babu Pipistrelle

(Synonymy in No. 26.)

Sabalgarh, ♀ 1.

(6) SCOTOPHILUS KUHLI, Leach.

The Common Yellow Bat

(Synonymy in No. 1.)

Guna, 1,564′; ♂ 9, ♀ 2; Agar Malwa, ♂ 3.

(7) SCOTOPHILUS WROUGHTONI, Thos.

Wroughton's Bat

(Synonymy in No. 1.)

Sabalgarh, ♀ 1.

(8) TAPHOZOUS LONGIMANUS, Hardw.

The Long-armed Sheath-tailed Bat

(Synonymy in No. 26.)

Binaganj, 1376′, ♀ 1.
This is a very large specimen H.B. 104 mm., T. 26, F.A. 61.

(9) LIPONYCTERIS KACHHENSIS, Dobs.

The Cutch Sheath-tailed Bat

(Synonymy in No. 3.)

Morar, ♂ 8; Sabalgarh, ♀ 1.

(10) RHINOPOMA HARDWICKEI, Gray.

The Lesser Indian Mouse-tailed Bat

(Synonymy in No. 3.)

Morar, ♂ 1, ♀ 2.

(11) RHINOPOMA KINNEARI, Wroug.

The Greater Indian Mouse-tailed Bat

(Synonymy in No. 1.)

Morar, ♂ 1, ♀ 4.

(12) PACHYURA, sp.

Shrews

Morar, ♂ 9, ♀ 5; Bhind, ♂ 3; Guna, ♂ 5, ♀ 29; Rothiai, ♂ 6, ♀ 1; Binaganj, ♂ 9, ♀ 4.
Awaiting further study.

(13) Felis affinis, Gray and Hardw.

The Jungle Cat

(Synonymy in No. 1.)

Morar, ♀ 1 ; Binaganj, ♀ 1 ; Rothiai, ♂, 1 ; Agar Malwa, ♀ 2.

(14) Paradoxurus niger, Desm.

The Indian Toddy Cat

(Synonymy in No. 5.)

Guna, ♂ 1, ♀ 1 ; Binaganj, ♂ 1, ♀ 3 ; Chachora Fort, ♀ 1 ; Agar Malwa, ♀ 1.

(15) Herpestes edwardsi ferrugineus, Blanf.

Blanford's Indian Mongoose.

(Synonymy in No. 24.)

Morar, ♂ 1 ; Sabalgarh, ♀ 1 ; Sheopore, ♀ 1.

(16) Herpestes edwardsi, Geoff.

The Common Bengal Mongoose

(Synonymy in No. 1, under M. Mungo.)

Morar, ♀ 1 ; Guna, ♂ 1, ♀ 2 ; Chachora Fort, ♀ 1 ; Agar Malwa, ♂ 4, ♀ 3.

(17) Canis indicus kola, Wrough.

The Common Jackal

(Synonymy in No. 1.)

Binaganj, ♀ 2 ; Agar Malwa, ♂ 2, ♀ 2.

(18) Vulpes bengalensis, Shaw.

The Indian Fox

(Synonymy in No. 1.)

Morar, ♂ 1 ; Binaganj, ♂ 2, ♀ 1 ; Agar Malwa, ♂ 2, ♀ 1.

(19) Funambulus pennati, Wrough.

The Common Five-striped Squirrel

(Synonymy in No. 1.)

Morar, ♂ 32 (I juv), ♀ 13 ; Bhind, ♂ 10, ♀ 2 ; Guna, ♂ 3, ♀ 4 ; Rothiai, ♂ 3, ♀ 3 : Khatia, ♂ 2, ♀ 3 ; Binaganj, ♂ 7, ♀ 5 ; Agar Malwa, ♂ 13, ♀ 4.

(20) Tatera indica, Hardw.

The Indian Gerbil

(Synonymy in No. 1.)

Morar, ♂ 19, ♀ 26 ; Bhind, ♂ 6, ♀ 2 ; Guna, ♂ 3, ♀ 15 (9 juv.) Rothiai. ♀ 1 ; Khatia, ♂ 5, juv. ♀ 3 ; Binaganj, ♂ 4, ♀ 6 ; Agar Malwa, ♂ 38, ♀ 20.

(21) Gunomys bengalensis, Gray and Hardw.

The Bengal Mole-Rat

(Synonymy in No. 15.)

Morar, ♂ 2, ♀ 2 ; Guna, ♂ 2, ♀ 4 (2 juv.) ; Rothiai, ♀ 7 (4 juv.) ; Agar Malwa, ♂ 6 ; Binaganj, ♂ 6, (4 juv.), ♀ 1 juv.

(22) Rattus rattus rufescens, Gray.

The Common Indian Rat.

(Synonymy in No. 1.)

Some of the specimens are coloured like *R. rufescens* ; Others like R. alexandrinus, but all are parasitic.

Morar, ♂ 1, ♀ 1 ; Bhind, ♂ 4, ♀ 2 ; Sabalgarh, ♀ 2 ; Guna, ♂ 3, ♀ 6 ; Binaganj, ♂ 9, ♀ 6 (2 juv.) ; Agar Malwa, ♂ 16, ♀ 2.

(23) MILLARDIA MELTADA, Gray.

The Soft-furred Field Rat

(Synonymy in No. 1.)

Morar, ♂ 1; Bhind, ♂ 2; Guna, ♂ 7, ♀ 15; Khatia, ♀ 1; Rothiai, ♀ 1; Binaganj, ♂ 3, ♀ 2; Agar Malwa, ♂ 10, ♀ 4.

(24) LEGGADILLA SADHU, Wrough.

The Ashy Spinpy Mouse

(Synonymy in No. 3.)

Bhind, ♂ 4, ♀ 4; In al. 6; Agar Malwa, ♂ 3, ♀ 2.

(25) MUS HOMOURUS, Hodge.

The Himalayan House Mouse

(Synonymy in No. 15.)

Guna, ♂ 3, ♀ 8; Rothioi, ♂ 3, ♀ 3; Binaganj, ♂ 3, ♀ 2.
The colour of the belly is whitish.

(26) MUS URBANUS, Hodgs.

The Nepal House Mouse

(Synonymy in No. 15)

Binaganj, ♂ 30, ♀ 13; Bhind, ♀ 1, In al. 2; Sabalgarh, ♂ 2.
Sheopore, ♀ 1; Agar Malwa, ♂ 18, ♀ 10; Chachora Fort, ♂ 9 ♀ 1.
Belly without sharp change of colour.

(27) LEGGADA BOODUGA, Gray.

The Southern Field Mouse

(Synonymy in No. 1.)

Morar, ♂ 8, ♀ 5; Bhind, In al. 3; Agar Malwa, ♂ 5.

(28) VANDELEURIA OLERACEA, Benn.

The Deccan Tree Mouse

(Synonymy in No. 2.)

Morar, ♂ 1, ♀ 1; Guna, ♀ 4, Rothiai, ♂ 1, ♀ 1; Khatia, ♂ 2, ♀ 1.
Binaganj, ♂ 3; Agar Malwa, ♂ 11, ♀ 3.

(29) GOLUNDA ELLIOTI, Gray.

The Indian Bush Rat

(Synonymy in No. 1.)

Morar, ♂ 2, ♀ 3; Binaganj, ♂ 5, ♀ 4; Agar Malwa, ♂ 26, ♀ 26.

(30) LEPUS RUFICAUDATUS, Geoff.

The Common Bengal Hare

(Synonymy in No. 15.)

Morar, ♂ 3, ♀ 1; Guna, ♀ 1; Binaganj, ♂ 1, and 5 juv.

(31) ANTILOPE CERVICAPRA, L.

The Black Buck

(Synonymy in No. 1.)

Guna, 1,564′, ♀ 1.

(32) ACANTHION LEUCURUS, Sykes.

The Common Indian Porcupine

(Synonymy in No. 1.)

Agar Malwa, ♂ 2, ♀ 2.

REPORT NO. 41, ASSAM AND MISHMI HILLS

BY MARTIN A. C. HINTON AND HELEN M. LINDSAY

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COLLECTION ... ... No. 41.
LOCALITY ... ... Assam and Mishmi Hills.
DATE ... ... October 1919–July 1920.
COLLECTED BY ... ... Mr. H. W. Wells.

The collection made by Mr. Wells in Assam and the Mishmi Hills aids considerably in the completion of the survey of the mammals of N. E. India, filling, as it does, the gap between the collections described in Reports Nos. 23, 26, 27, 28, 37, dealing with Sikkim, Darjeeling, Bhutan, Duars, Kalimpong and Nepal respectively on the west side, and Report No. 38 describing collection of specimens from the Naga Hills on the east.

The area visited by Mr. Wells lies between 25°N. and 29°N. and 90°E. and 97°E, thus practically embracing the whole province of Assam—53,000 sq. miles—excluding the small part comprising Manipur and the Lushai Hills—8,500 sq. miles. According to the *Gazetteer*, from which much of the information about the country has been taken, Assam falls into three natural divisions :—

(1) SURMA VALLEY.—A flat plain about 125 miles long by 60 miles wide shut in on three sides by ranges of hills. The western end of the valley is very low, only about 22·7 ft. above sea-level, and in the rains the West Sylhet part is completely under water. Cachar and East Sylhet are higher. Here 'blue hills bound the view on almost every side, the villages are buried in 'groves of slender palms, feathery bamboos and broad-leaved plantains, and 'even in the dry season the country looks fresh and green.' Little or no forest exists in Sylhet, but there are extensive Reserves in the South and East Cachar District.

(2) BRAHMAPUTRA VALLEY.—An alluvial plain about 450 miles in length with an average breadth of about 50 miles, this is also shut in by hills on every side except the west. As a whole, it is a plain of fairly uniform breadth except in the centre where the Mikir Hills project from the main mass of the Assam Range. Outcrops of gneissic rock above the alluvium between Tezpur and Dhubri, and ranges of low hills in the central part of Goalpara District break the even level of the plain. On either side, the Brahmaputra is edged by stretches of marsh land, beyond which comes a belt of rice fields and fruit trees. Beyond that belt near the hills, grassy plains and forests are interspersed with prosperous tea gardens. There are still large areas not cultivated, consisting of huge wastes where heavy forest alternates with Savannah land, covered with a dense growth of reeds and elephant grass, 14′–16′ high. In these wastes are found buffalo, rhinoceros, and swamp and hog deer.

(3) THE ASSAM RANGE.—Mountains separating these two valleys and projecting at right angles from the Burmese system. It lies almost due east and west. At its western end it attains a height of more than 4,600 ft. in the peak of Nokrek, above the station of Tura, the head-quarters of the Garo Hills District. Here the hills are broken up into sharply serrated ridges and deep valleys, all alike covered with forest. Near Shillong in the Khasi Hills, 6,450 ft. is the highest peak in a tableland about 6,000 ft. high with wide stretches of oak and pine. The highest point in the province of Assam proper is Japvo, 9,890 ft. in the Naga Hills, where the hills are all of the serrated type, the sides clothed with forest or fallowing jhums.

The MISHMI HILLS shutting in the eastern end of the Brahmaputra Valley seem to be a continuation of the Burmese axials. There are some peaks of 1,500 ft. but little is known about this tract of the country.

The basis of the whole Assam Range is a gneissic rock. Sandstones and conglomerates of the Cretaceous System are superimposed upon the gneiss, and are themselves in turn overlaid by limestone and sandstone of the Nummulitic age, especially at the western end of the range. Thus the late Mrs. Jackson in her note on the Garo Hills speaks of the fossil beds and the limestone caves to be found there. It appears, to quote the *Gazetteer*, little is known of the eastern extremity of the Assam Range. Apparently Upper Tertiary sandstones 'are succeeded by a series of hard sandstones, slates and shales with quartzose beds, while still further east serpentine dykes, indentical in composition with those of Burma, run north and south.' The hills containing the coal measures of Sibsagar and Lakhimpur consist of an enormous thickness of sandstones, the upper series of which are topped with conglomerates and clay.

The climate of Assam is characterized by coolness and extreme humidity. In the Rains especially, it does not stimulate to prolonged physical exertion. Mr. A. Primrose in his note on Assam states that except for four months of the year the climate is decidedly bearable to Europeans, but these must be of naturally strong constitution and thoroughly acclimatized, for all the year round malaria is prevalent. There are two distinct seasons:—cold from November to February; rains from March to October. Rainfall is always abundant, so that floods rather than droughts occur, the average amount annually precipitated varying from 85″ at Sibsagar, 115″ at Goalpara and 124″ at Silchar to 458″ at Cherrapunji. It has been noted that since the earthquake of 1897 the floods in Lower Assam are of greater intensity and duration. Earthquakes are very frequent all over the province.

As the *Gazetteer* points out, the character of the surface and the climate of Assam are ideal for forest growth and the area of wooded country is very extensive. But the method of cultivation employed by most of the hill tribes does not help in the growth of really great forest. This method is called the JHUM system and is thus described in the *Gazetteer*:—

'A patch of land is cleared with axe and fire, the soil is hoed up and the 'seeds of hill rice, chillies, cotton, millets, gourds and other vegetables are 'dibbled in among the ashes. The same plot is seldom cropped for more than '2 or 3 years in succession. After this time the weeds spring up in great 'luxuriance and further cultivation would destroy the roots of Ikra or Bamboo 'jungle, upon which the land depends for its fertility. JHUMS are left fallow 'for as long a time as possible, four years at the very least. This system of 'cultivation and forest fires have denuded the interior of the hills where the 'people chiefly live.'

For a Field Collector Assam presents many difficulties.

On the one hand, in the hill areas of the frontier, such as Mishmi Hills, the Abor, or Aka country, the aboriginal tribes resent interference and intrusion, and, as Mr. A. Primrose says in his Note, the greatest tact, patience, and firmness are required in any dealings with them. But he has found that though they deeply feel harshness or what they consider injustice, they do respond to kindly treatment, and, away from outside influence, are a 'very cheerful, simple, honest and likeable lot.' On the other hand the habits of the imported coolies in the cultivated areas and tea districts have practically exterminated all the mammalia around them. The Mundas, Oraons, and especially the Santhals eat any sort of animal, and employ fires, traps and poison as well as bows and arrows in their pursuit of creatures for food. Mr. Primrose remarks on the fact that few animals are ever met with in the forests, in which the silence is intense, just as in the forest of the Sunderbans area. He found better results to be got on the outskirts of the forests or along the streams running into them.

The question of transport is another difficulty. Mr. Wells found roads were for the most part bad, when they did exist at all, bullock carts were hard to obtain, while boat hire was excessive, and heavy mists caused much delay. But for a collector, the climate is the biggest drawback. In his diary, Mr. Wells frequently mentions the loss of his traps by heavy rain washing them away or by debris brought down by the storm covering them up, also the loss of time caused by inundation of the jungle paths. The climate not only affects one's health and working capacity, but it also causes endless trouble in the preparation of specimens. Even with a fire it was found impossible to get the skins of his specimens dry enough to ensure their preservation, and many of these were lost owing to the excessive humidity.

In his diaries Mr. Wells records his thanks for kind assistance to the following:—Mr. Bishop of Godagari; Mr. Brown of Hokenguri; Mr. Garrett, the Forest Officer; Mr. Milroy, whom he accompanied on keddah; Mr. Middleton of Sonepur; Mr. Hinde of Rangiya; Dr. Grant of Margherita; Mr. James, the missionary at Cherrapunji; The late Mrs. Jackson gave invaluable help to Mr. Wells in the Garo Hills area.

The areas visited between October 1919 and July 1921 may best be divided into the following centres :—

1. Margherita—Ledo, Namlang River, Powai, Doom Dooma, Digboi, Bara Hapjan, Kharjan.
2. Sadiya—Dibong River, Lohit Valley.
3. Golaghat—Mikir Hills, Kaziranga Reserve, Kumta.
4. Garo Hills—Tura, Rangapari, Dura Bandar, Duragiri.
5. Shillong and Khasi Hills—Mowphlong, Cherrapunji, Laitkynsao, Laiterai, Nongprieng, Nongpoh.
6. Jaintia Hills—Jowai, Jarain, Syndai, Shanpung, Konshnong, Hot-springs.
7. S. Kamrup—Kulsi, Rajapara.
8. Cachar—Lamsakhang, Langting, Dirangmukh, Hathikhali, Lanka.
9. N. Kamrup—Angarakhata, Matanga River.
10. Mishmi Hills—Dening, Tiki, Dreyi, Tejir.

The collection numbers 2097 specimens in 98 species belonging to 70 genera. It includes three new species, viz. :—

Soriculus radulus, *Leggada jachsoniæ*, *Leggada nagarum* ; also ten new sub-species, viz. :—*Pithecus pileatus saturatus*, *Pithecus pileatus tenebricus*, *Scotamanes ornatus imbrensis*, *Tupaia belangeri assamensis*, *Tupaia belangeri versuræ*, *Dacuomys wroughtoni*, *Rattus listeri garorum*, *Callosciurus erythræus wellsi*, *Dremonys lokriah garorum*, *Rattus rattus wellsi*. In character it closely resembles that from Nepal described in No. 37, but here there are no bears, no Tatera, no Funambulus represented. Part of the material collected was examined by the late Mr. Wroughton, and his notes, which are in each case acknowledged, have been incorporated in this Report as well as those from the diaries of the Field Collector, Mr. Wells.

(1) Hylobates hoolock, Harl.

The Hoolock

(Synonymy in No. 14)

Naga Hills—Margherita, (1,200′) ♂1 (juv.), ♀ 1.
Lakhimpur—Bara Hapjan (300′) ♂ 1, ♀ 1 ; Golaghat ♂1.
Mishmi Hills—Chikorpani, ♂ 1 skeleton.

These creatures are fairly common, but keep mainly to the hills, occasionally coming down to the low country probably in passing from one range to another. The range of this gibbon in the Mishmi Hills seems rather obscure. It has been reputed to range for 100 miles north of Sadiya but the Mishmis do not know of it beyond the Digaun River. The Mishmis say there are only three parties of these gibbons, each about 10 or 12 in number, in the Dening District.

Vernacular name—Hueleng (Khasi)

(2) Macaca assamensis, Mc Cl.

The Assam Macaque

(For synonymy see Hinton and Wroughton, J.B.N.H.S., xxvii,, p. 668.)
Mishmi Hills—Tecang River (2,000′), ♂ 2.
Vernacular name—Ta′mim (Mishi).

(3) Macaca mulatta, Zimm.

The Rhesus

(For synonymy see Hinton and Wroughton, J.B.N.H.S., p xxxii, p. 668.)
Naga Hills—Margherita (200′), ♂ 1 (juv.)
Khasi Hills—Nongpoh (1,200′), ♀ 1 (juv.)
Jaintia Hills—Hot Springs (2,400′), ♀ 1.
S. Kamrup—Rajapara (600′) ♂ 2 ; Kulsi (750′), ♀ 2 juv.
Cachar Hills—Lamsakhang (200′), ♀ 1.
Mishmi Hills—Dening (2,243′), ♀ 3.
Sibsagar—Golaghat (300′), ♂ 1.

These are very common near Margherita and Rajapara.

Vernacular name—Shirit (Khasi)

(4) Pithecus pileatus, Blyth.

The Capped Langur

(Synonymy in No. 20)

Garo Hills—Tura (1,400′), ♂ 1, flat skins 3, no skulls.
Khasi Hills—Laitkynsao (2,000′), ♂ 1 juv.
Jaintia Hills—Konshnong (3,000′), ♂ 1 juv., ♀ 2 (1 juv.).
Sibsagar—Golaghat (400′), ♀ 2; Raheng, ♀ 1.
This species is very common round Tura.

Vernacular name—Ingaw (Khasi)

Mr. Wells notes that these monkeys are generally found in parties of 5–8, and the cry is a sharp chak-chak repeated at short intervals. The female I shot weighed 18·6 lbs. and measured H. and B. 560‴ T. 930‴, H.F. 175‴, Ear 30‴. The young one is much lighter in colour with the tuft at the end of the tail a brownish white and distinctly waved hair.

(5) Pithecus pileatus saturatus, Hint. subsp. nov.

The Capped Langur

(1921 *Pithecus pileatus saturatus,* Hinton, J. B. N. H. S., xxix, p. 81)

Lakhimpur—Bara Hapjan (200′), ♂ 3.
Sibsagar—Golaghat (400′), ♂ 3.
This sub-species is met with in the low ground, but does not reach the cool jungles at high altitudes inhabited by *Pithecus pileatus pileatus.*

(6) Pithecus pileatus tenebricus, Hint, subsp. nov.

The Capped Langur

(1921 *Pithecus pileatus tenebricus* Hinton, J. B. N. H. S., xxix, p. 81)

North Kamrup—Angarakhata (300′), ♂ 3, ♀ 2.
The geographical variation and distribution of the species are fully discussed in the paper cited above.

(7) Pteropus giganteus, Brünn.

The Common Flying Fox

(Synonymy in No. 2)

Sibsagar—Golaghat (300′), ♂ 3, ♀ 1; Doom Dooma, ♂ 4.

(8) Cynopterus sphinx, Vahl.

The Short-nosed Fruit Bat

(Synonymy in No. 4)

Sibsagar—Golaghat (300′), ♂ 1.
Naga Hills—Margherita (400′), ♂ 1

(9) Rhinolophus affinis himalayanus K. And.

The Himalayan Horseshoe Bat

1897, *Rhinolophus affinis.* Blanford Mamm. No. 150 (partim).
1905, *Rhinolophus affinis himalayanus.* K. Anderson, P.Z.S., p. 103.
Khasi Hills—Cherrapunji (5,500′), ♂ 2, ♀ 8; Laitkynsao (4,000′), ♂ 8, ♀ 15.
Jaintia Hills—Shangpung (4,000′), ♂ 8, ♀ 15; Syndai (2,500′), ♂ 1 Konshnong (3,000′), ♂ 1, ♀ 2.
The caves at Laiterai, 5 miles from Cherrapunji, where these bats live, were, 200′ up the sheer face of a cliff and without a rope could not be got at from any point. The Khasis say that in the months of February, March and April the bats issue every evening from the caves in myriads. From May onwards they are said to hibernate.

(10) Rhinolophus blythi szechuands, K. And.

The Szechuan Horseshoe Bat

1918, *Rhinolophus blythi szechuanus* K. Anderson, A. M. N. H., 9, p. 376.
Sibsagar—Golaghat (300′), ? 1.

(11) RHINOLOPHUS FERUM—EQUINUM TRAGATUS Hodgs.

Hodgson's Horseshoe Bat

(Synonymy in No. 23, also No. 36).

Mishmi Hills—Dening (2,240′), ♂ 1.

Vernacular name,—KA'PWINA (Mishmi).

(12) RHINOLOPHUS LEPIDUS Blyth

The Little Indian Horseshoe Bat

(Synonymy in No. 6)

Jaintia Hills—Syndai (2,500′), ♂ 1; Konshnong (3,000′), ♂ 1, ♀ 1, Shangpung (4,000′), ♂ 1, ♀ 1.

(13) RHINOLOPHUS PEARSONI, Horsf.

Pearson's Horseshoe Bat

(Synonymy in No. 15)

Jaintia Hills—Konshnong (3,000′), ♂ 8, ♀ 7.
Khasi Hills—Cherrapunji (4,500′), ♀ 1.

(14) RHINOLOPHUS PERNIGER, Hodgs.

The Himalayan Horseshoe Bat

(Synonymy in No. 14)

Jaintia Hills—Konshnong (3,000′), ♂ 3, ♀ 1.

(15) RHINOLOPHUS YUNANENSIS, Dobs.

The Yunan Horseshoe Bat

1872. *Rhinolophus yunanensis* Dobson, J. A. S. B., xli, pt. 2, p. 336.
1897. *Rhinolophus pearsoni* Blanford, No. 149 partim.
Mishmi Hills—Dening (2,240′), ♂ 1.

It is preferable to refer this specimen definitely to *yunanensis*, since the measurements are distinctly greater than for *pearsoni*. Mr. Wells noted it had a very strong smell.

(16) HIPPOSIDEROS ARMIGER Hodgs.

The Great Himalayan Leaf-nosed Bat

(Synonymy in No. 14)

Khasi Hills—Laitkynsao (2,000′), ♂ 2, ♀ 1.
Garo Hills—Dura Bandar (1,500′), ♂ 2, ♀ 7.
Jaintia Hills—Konshnong (3,000′), ♂ 15, ♀ 10.
,, Shangpung (4,000′), ♂ 4, ♀ 3.
S. Kamrup—Rajapur (600′), ♂ 3, ♀ 3.

Only the ♂s have the strong smell, and are very fat at this time of the year—August, 1920. H.W.W.

(17) HIPPOSIDEROS CINERACEUS, Blyth.

Blyth's Leaf-nosed Bat

(Synonymy in No. 37)

Khasi Hills—Cherrapunji (4,800′), ♂ 2, ♀ 1.
Jaintia Hills—Shanpung (4,000′), ♂ 1.
Lakhimpur—Golaghat (300′) in al. 1.
Naga Hills—Margherita (200′) in al. 1.
Mishmi Hills—Tiki (1,440′), ♂ 1

(18) Hipposideros gentilis gentilis K. And.

The Bi-coloured Leaf-nosed Bat.

1918. *Hipposideros gentilis gentilis.* K. Andersen, A.M.N.H , 9, 11, p. 380.
Naga Hills—Margherita (200'), ♂ 1, in al. 2.
Sibsagar—Golaghat (300'), in al. 2.
Garo Hills—Dura Bandar (1,500'), ♂ 3.
Khasi Hills—Cherrapunji (5,300'), ♂ 10, ♀ 9, in al. 8.
,, Laitkynsao (2,000'), ♂ 6, ♀ 6.
Kamrup—Gauhati, ♀ 1 ; Rajapur, ♂ 1.
Mishmi Hills—Tiki (1,440'), ♂ 2 ; Dreyi (6000'), ♂ 1.

' Dr. Anderson was at work on the Rhinolophidæ but most unfortunately was prevented from finishing the classification beyond a fragmentary paper from which I have taken this name which only a short time ago we should have listed as *fulvus.'—R.C.W.*

(19) Hipposideros leptophyllus, Dobs.

The Khasi Leaf-nosed Bat

1874. *Phyllorhina leptophylla.* Dobson, J.A.S.B., p. 234.
1891. *Hipposideros leptophyllus.* Blandford, Mamm. No. 160.
Khasi Hills—Laitkynsao (2,000'), ♂ 20, ♀ 3, in al. 3.
,, Nongpoh (1200'), ♀ 2.
S. Kamrup—Rajapur (600'), ♀ 1.

(20) Coelops frithi, Blyth.

The Tailless Leaf-nosed Bat

1848. *Coelops frithi*, Blyth. J.A.S.B., xvii, p. 251.
1891. *Coelops frithi*, Blanford, Mamm. No. 168.
Khasi Hills—Cherrapunji (4,500'), ♂ 1.

(21) Megaderma spasma majus, K. And.

The Chindwin Megaderm

1891. *Megaderm spasma*, Blanford, Mamm. No. 170.
1918. *Megedarma spasma majus*, K. Andersen, A.M.N.H., 9, 11, p. 383.
Kamrup—Kulsi (150'), ♀ 1 ; Rajapur (600'), ♂ 2, ♀ 3.

This sub-species was originally reported under the name of *M. s. trifolium* which in 1918 was sub-divided by Dr.K. Andersen into *trifolium*, *majus*, *medium* and *minus*.

(22) Lyroderma lyra, Geoff.

The Indian Vampire Bat

(Synonymy in No. 1)

S. Kamrup—Polasbari, (600'), ♀ 1.
N. Kamrup—Angarakhata (300'), ♂ 1, ♀ 2.

(23) Barbastella darjelingensis, Hodgs.

The Eastern Barbastel

(Synonymy in No. 26)

Jaintia Hills—Shangpung (4,000'), ♂ 1.

(24) Pipistrellus babu, Thos.

The Babu Pipistrel

(Synonymy in No. 26)

S. Kamrup—Rajapura (600'), ♂ 3, ♀ 9.

(25) Pipistrellus coromandra Gray.

The Coromandel Pipistrel

(Synonymy in No. 5)

Jaintia Hills—Konshnong (3,000'), ♂ 1, ♀ 2.
Lakhimpur—Sadiya (600'), ♂ 2, ♀ 6.

(26) PIPISTRELLUS MIMUS, Wroughton.

The Southern Dwarf Pipistrel

(Synonymy in No. 1)

Sibsagar—Golaghat (350′), ♀ 6, in al ♂ 3.
Khasi Hills—Laitkynsao (2,500′), ♂ 1, in al 1.
N. Kamrup—Angarakhata (300′), ♂ 2.
S. Kamrup—Rajapura (600′), ♂ 4, ♀ 1.

'I named this Bat from the seacoast near Bombay, yet almost every Survey Collection from India proper, i.e., excluding Burma has obtained it.'

(27) SCOTOPHILUS KUHLI, Leach.

The Common Yellow Bat

(Synonymy in No. 1)

Naga Hills—Margherita (200′), ♂ 1.
S. Kamrup—Rajapura (600′), ♂ 5, ♀ 2.

Four specimens caught at Rajapura on November 14, 1920, were apparently hibernating. Colour is variable in both sexes, bright chestnut in three specimens, yellowish brown in the fourth. These bats had a heavy coating of fat and were very strong smelling.

(28) SCOTOPHILUS WROUGHTONI, Thos.

Wroughton's Bat

(Synonymy in No. 1)

Garo Hills—♂ 1 in al.

(29) SCOTOMANES ORNATUS IMBRENSIS, Thos. subsp. nov.

The Assam Harlequin Scotophil

1891. *Nycticejus ornatus.* Blanford Mamm. No. 197.
1922. *Scotomanes ornatus imbrensis.* Thomas, J.B.N.H.S., xxvii, p. 772.
Garo Hills—Duragiri (3,500′), ♀ 1, in al 1.
Jaintia Hills—Konshnong (3,000′), ♂ 1; Jowad (4,500′) ? 1.
Mishmi Hills—Dening (2,240′), ♂ 1, ♀ 3.

Mr. Wells in his Diary for June, 1921, says that 'this species was fairly 'common over open ground. These bats have only just come out of hiberna'tion as there were none about when we were last at Dening (March, 1921).'

Vernacular name for Bats—MAHTRA or TOBOK (Garo Hills), LYMBIT (Khasi)

(30) MYOTIS SILIGORENSIS, Tomes.

The Darjeeling Bat

(Synonymy in No. 37)

Jaintia Hills—Konshnong (3,000′), ♂ 1, ♀ 1.

(31) LEUCONOE sp.

Jaintia Hills—Konshnong (3,000′).
'The specimen is too young for identification.' *R.C.W.*

(32) MURINA CYCLOTIS, Dobs.

The round-eared Tube-nosed Bat

(Synonymy in No. 23)

Jaintia Hills—Konshnong (3,000′), ♂ 1, ♀ 1.

(33) MURINA TUBINARIS, Scully.

Scully's Tube-nosed Bat

(Synonymy in No. 25)

Jaintia Hills—Shangpung (4,000′), ♀ 1.
Mishmi Hills—Dening (2,240′), ♂ 2, ♀ 7.

These bats apparently breed in April and May as all five females taken at Dening in May 1921 were pregnant—three containing each one, and two with each two young.

(34) KERIVOULA HARDWICKEI, Horsf.

Hardwicke's Bat

(Synonymy in No. 26)

Jaintia Hills—Konshnong (3,000′), ♂ 6, ♀ 4.
Shangpung (4,000′), ♂ 6, ♀ 4.
S. Kamrup—Rajapura (600′), ♀ 1 unsexed 1.

(35) TUPAIA BELANGERI ASSAMENSIS, Wrought, subsp. nov.

The Assam Tree Shrew

1921. *Tupaia belangeri assamensis.* Wroughton, J.B N.H.S., xxvii, p. 599
Lohit Valley (800′), ♂ 2.
Garo Hills—Tura ♂ 4, ♀ 2 ; Dura Bandar, ♀ 1 ; Duragiri, ♀ 2.
Khasi Hills—Laitkynsao (2,000′), ♀ 2.

'The forms *chinensis* and *siccata* are both of a pale grizzle of which the modifying component is yellow and gives the general effect of 'olive green', while in *yunalis* and *assamensis* the modifying colour of the grizzle is red and there is no green tinge, general effect being dark brown.'—*R.C.W.*

Vernacular name—MAD (Garo) ; KMUD (Khasi)

(36) TUPAIA BELANGERI VERSURÆ, Thos., subsp. nov.

The Mishmi Tree Shrew

1922. *Tupaia belangeri versuræ.* Thomas, J.B.N.H.S., xxviii, p. 428.
Mishmi Hills—Dening (2,240′), ♂ 8, ♀ 3 ; Dreyi (6,000′), ♂ 1, ♀ 1.

Mr. Wells notes 'I understand this Tupaia breeds during May and June and 'makes its nest in holes, under roots of trees, etc. Three to five young are 'born naked and blind.'

Vernacular name—A' CHUBUA (Mishmi)

(37) TALPA MICRURA, Hodgs.

The Short-tailed Mole

(Synonymy in No. 23)

Mikir Hills (1,400′), ♀ 1 ; Mishmi Hills—Dening (2,240′), ♀ 2.

One specimen taken at Dening was of a blue gray colour with a short tail (10 mm.) black, with numerous hairs at the end. The snout is flesh coloured with a small white streak on the face above.

(38) PARASCAPTOR LEUCURUS, Blyth.

The White-tailed Mole

(Synonymy in No. 36)

Khasi Hills—Cherrapunji (4,500′), ♂ 2, ♀ 2.
Jaintia Hills—Shangpung (4,500′), ♂ 1, ♀ 2 ; Jowai (4,500′), ♀ 2.

These moles frequent gardens and potato patches. They throw out an offensive smell when handled or confined in a box.

Vernacular name—KYNDAT (Khasi)

(39) SORICULUS CAUDATUS, Horsf.

Hodgson's Brown-toothed Shrew

(Synonmy in No. 15)

Mishmi Hills—Dreyi (6,000′), ♂ 1, ♀ 3, in al. 2.

(40) SORICULUS RADULUS, Thos., sp. nov.

The Mishmi Brown-toothed Shrew

1922. *Soriculus radulus.* Thomas, J.B.N.H.S., xxviii, p. 429.
Mishmi Hills—Dreyi (6,000′), ♀ 1.

(41) CROCIDURA RUBRICOSA, And.

Anderson's Assam Shrew

(Synonmy in No. 25)

Naga Hills—Margherita (200′), ♂ 1, ♀ 2.
Lakhimpur—Sadiya (500′), ♂ 2, ♀ 1.
Sibsagar—Golaghat (300′), ♂ 2, ♀ 3, in al. 1.
Garo Hills—Tura, (1,400′), ♂ 1, in al. 1.
Khasi Hills—Laitkynsao (2,000′), ♂ 1.
Jaintia Hills—Jowai (4,400′), ♂ 1, ♀ 1 ; Konshnong (3,000′), ♂ 1 Syndai in al 1 ; Shangpung (4,000′), ♂ 1.
N. Kamrup—Angarakhata (300′), ♂ 21, ♀ 14.
S. Kamrup—Rajapura (600′), ♂ 1.
N. Cachar—Lanka (400′), ♂ 2, ♀ 2.
Mishmi Hills—Dening (2,240′), ♂ 4, ♀ 1 ; Dreyi (6,000′), ♂ 1, ♀ 3.

Vernacular name—CHUCHU (N. Kamrup) TA'PEKING (Mishmi) for all shrews.

(42) PACHYURA, sp.

The Musk Rat

Naga Hills—Margherita (200′), ♂ 1, ♀ 2.
Sibsagar—Golaghat (300′), ♂ 5, ♀ 5.
Garo Hills—Tura (1,440′), ♂ 2, ♀ 3 ; Dura Bandar (1,200′), ♀ 2, Duragiri (3,000′), ♀ 1.
Khasi Hills—Nangpoh (1,200′), ♀ 2.
Jaintia Hills—Shangpung (4,000′), ♀ 4.
N. Kamrup—Angarakhata (300′), ♂ 26, ♀ 14.
S. Kamrup—Rajapura (600′), ♂ 9, ♀ 7.
N. Cachar—Lanka (300′), ♂ 1, ♀ 3.
Mishmi Hills—Tiki (1440′), ♂ 2.

At Golaghat Mr. Wells noted that these shrews have large burrows easily recognized by the wide mouth as though the earth had fallen in for a few inches before the actual hole commences. The species was not found at Dening though he got it at Tiki, 1,000′ lower, under similar conditions.

Vernacular name—CHUCHANDRA (N. Kamrup.)

(43) PACHYURA HODGSONI, Blyth.

The Himalayan Pigmy Shrew

(Synonymy in No. 15)

Jaintia Hills—Shangpung (4,000′), ♂ 2, ♀ 1.

(44) ANOUROSOREX SQUAMIPES, A.M. Edw.

The Assam Short-tailed Shrew

(Synonymy in No. 25)

Garo Hills—Tura, ♀ 1.
Jaintia Hills—Jowai (4,500′), ♂ 8, ♀ 4 ; Shangpung (4,200′), ♂ 8, ♀ 11 ; Konshnong (3,000′), ♂ 1.
Mishmi Hills—Dening (2,240′), ♂ 19, ♀ 8 ; Dreyi (6,000′), ♂ 10, ♀ 8.

(45) FELIS AFFINIS, Gray.

The Jungle Cat

(Synonymy in No. 1)

N. Kamrup—Angarakhata (300′), ♂ 1.
Mishmi Hills—Dening (2,240′), ♂ 1.

Vernacular name—A'CHAGUN (Mishmi.)

(46) FELIS BENGALENSIS, Kerr.

The Leopard Cat

(Synonymy in No. 11)

Garo Hills—Tura (1,450′), ♂ 1.
Khasi Hills—Shillong (5,200′), ♂ 1.
Jaintia Hills—Jowai (4,300′), ♀ 1 juv.

Vernacular name—KUI (Khasi) for all wild cats.

(47) Felis temmincki, Vigors and Horsf.

The Golden Cat.

(Synonymy in No. 14)

Mishmi Hills—Teju (3,000′), ♂ 1.

The Mishmis say that this cat breeds in hollow trees and has two young, also that it kills fawns and other small animals.

(48) Peiondon pardicolor (Hodgs.)

The Indian Tiger Civet

(Synonymy in No. 23)

Mishmi Hills—Dening (2,240′), ♀ 1.

(49) Viverra zibetha, L.

The Large Indian Civet.

(Synonymy in No. 14, also see No. 17)

Lakhimpur—Sadiya (800′), ♂ 1.
Sibsagar—Golaghat (300′), ♂ 2, ♀ 3, juv. 1, unsexed 1.
Garo Hills—Tura ♂ 1 ; Duragiri (3,000′), ♀ 1 ; Dura Bandar ?1.
Jaintia Hills—Shangpung (4,000′), ♀ 1 ; Konshnong (3,000′), ♂ 1, ♀ 1.
S. Ramrup—Rajapura (600′), ♂ 2, ♀ 2.

Vernacular name—Matni (Garo.)

(50) Viverricula malaccensis, Gmel.

The Small Indian Civet

(Synonymy in No. 3)

Sibsagar—Golaghat (300′), ♂ 1, ? 1.
N. Kamrup—Angarakhata (300′), ♂ 3.

Mr. Wells notes that this civet can with ease climb a vertical tree trunk.

Vernacular name ;—Matjol (Garo) : Bshad (Khasi).

(51) Paradoxurus strictus, Hodgs.

The Sikkim Palm Civet

(Synonymy in No. 16, under *hermaphorditus*)

Sibsagar—Golaghat (300′), ♂ 1, flat skin 1, juv. 1
Garo Hills—Dura Bandar (1,300′) ? 1.
N. Kamrup—Darranga River (400′), ♂ 1.

(52) Paguma grayi, Benn.

The Himalayan Palm Civet

(Synonymy in No. 15)

Garo Hills—Duragiri (300′), ♂ 1.
Mishmi Hills—Dening (2,240′) 1 dried skin.

(53) Herpestes nepalensis, Gray.

The Nepal Mongoose

(Synonymy in No. 19)

Lakhimpur—Kazirunga (250′), ♀ 4.
Sibsagar—Golaghat (300′), ♀ 1.
Jaintia Hills—Konshnong (3,000′), ♂ 1 juv.
N. Kamrup—Angarakhata (300′), ♂ 2, ♀ 5.

The survey took this mongoose in Midnapur, Bengal.

' Gray gave the type locality as " North India see Report No. 27."'—*R.C.W.*

Vernacular name:—Angrebu (Garo) ; Ksar (Khasi) :

(54) Herpestes urva, Hodgs.

The Crab-eating Mongoose.

(Synonymy in No. 23)

Garo Hills—Tura unsexed 1.
S. Kamrup— Rajapura (600′), ♀ 1 weighing 3 lbs.

(55) CANIS INDICUS, Hodgs.

The Jackal

(Synonymy in No. 1, under *C. aureus*)

Jaintia Hills— Shangpung (4,000′), flat skin 1.
Jowai (4,500′), juv. 2.
Naga Hills—Margherita, ♂ 1.
Sibsagar—Golaghat (300′), ♂ 1.
S. Kamrup—Rajapura (600′), ♀ 1.

Mr. Wells made some interesting notes on the ‘ calling ’ of these animals. ‘ At Lanka in October 1920, he wrote, ‘ I heard the Jackals calling for the first ‘ time since the beginning of the hot weather. The local natives confirm the ‘ fact that one hears them only in the cold weather.’

(56) CHARRONIA FLAVIGULA, Bodd.

The Northern Indian Marten

(Synonymy in No. 15)

Garo Hills—Tura (1,400′), ♂ 1.

This is a very sly and wary creature, who turns hives over and eats the honey.

Vernacular name—MAPRA (Garo Bsong) (Khasi).

(57) MELOGALE PERSONATA, Geoff.

The Burmese Ferret Badger

(Synonymy in No. 16 under *Helictis personata*)

Khasi Hills—Laitkynsao (2,500′), ♂ 1.

Mr. Thomas has recently revived the generic name *Melogale.* This animal is not common anywhere in these hills, so the Khasis say. A shikari told Mr. Wells that there is a belief amongst the Khasis that when a ‘ Shrong ’ or village Tomcat grows very large it runs away to the jungle and turns into a K′SA, as this Melogale is called by the people of Shella, a small hill state.

Vernacular name—WAKSAGEL (Garo) : B′SHAD (Khasi) meaning a kind of civet.

(58) ARCTONYX COLLARIS, F. Cuv.

The Hog Badger

(Synonymy in No. 25)

Jaintia Hills—Hotsprings (2,400′), ♀ 1.

(59) LUTRA LUTRA NAIR, F. Cuv.

The Common Otter

(Synonymy in No. 11)

Lakhimpur—Sadiya (500′), ♂ 1 ; Kaziranga (250′), ♀ 1 flat skin.
S. Kamrup—Rajapura ♂ 1.
Jaintia Hills—Shangpung (4,000′), 1 flat skin.
Jowai (4,500′) juv. 2.

These otters are becoming a trouble to the Assamese fishermen clearing their lines every evening, leaving only the heads of the fish. At Rajapura a small ♀ otter, immature (weight 3′5 lbs.) was brought in from a ‘ bhil,’ which had a most pathetic cry when handled, something like a kitten.

Vernacular name—KSIH (Khasi).

At Shillong Mr. C. H. Holder showed Mr. Wells some skins of the smooth Indian otter (*Lutrogale barang tarayensis*), which he had caught in the neighbourhood. He told Mr. Wells that the otters made their appearance in the district only when he started breeding trout and he has killed quite a number lately. There must be some special reason to account for their coming, ‘ as the only water anywhere near is the mountain stream and no otter could live in that as there is less depth than 6′′.’

(60) AMBLONYX CINEREA, Illig.

The Clawless Otter

(Synonymy in No. 11 under *Aonyx cinerea*)

Sibsagar—Golaghat (300′), ♂ 1, ♀ 1.
Garo Gills—Tura unsexed 1.
Jaintia Hills—Hot springs (2,400′), juv. 2 ; Jowai (4,500′), ♀ 1.

(61) HELARCTOS MALAYANUS, Raff.

The Malay Bear

(Synonymy in No. 14)

Garo Hills—Duragiri (3,000′), ♀ 1 juv.

These bears are frequently seen on the very high trees, seeking berries.

NOTE.—*Melursus ursinus.* While in the Lohit Valley Mr. Wells wrote, 'Although I have not seen any, the Sloth Bear is evidently common as I 'have often come across large holes dug, by these animals (so the natives tell 'me) in their search for ants' and bees' nests, etc. To-day I saw four such 'holes within 20 yds.—one nearly 3 ft. 6 in. diameter and about 5 ft. deep.'

(62) PETAURISTA YUNNANENSIS, And.

Anderson's Flying Squirrel

(Synonymy in No. 36)

Mishmi Hills—Tiki (1,440′), ♂ 2; Dreyi (4,000′), ♂ 1.

At Dreyi both this and the following species occurred fairly commonly but it was difficult to capture specimens. These animals have a peculiar 'miawing' cry when in flight, generally uttered just before they alight on their objective. It would appear that they live in small colonies, probably 2 ♂s and some ♀s.

Vernacular name :—K'MAI (Mishmi).

(63) PTEROMYS (HYLOPETES) ALBONIGER, Hodgs.

The Particoloured Flying Squirrel

(Synonymy in No. 20)

Jaintia Hills—Konshnong (3,000′), ♂ 14, ♀ 14.
Khasi Hills—Laiterai (2,400′) unsexed 1.
Mishmi Hills—Dening (2,240′), ♂ 2, ♀ 2.

For their home these squirrels usually seem to choose a tree with a trunk clear to 40 or 50 ft. up. They are used for food.

Vernacular name—HAGRAI (Mishmi).

(64) RATUFA GIGANTEA, McCL.

The Assam Giant Squirrel

(Synonymy in No. 14.)

Lakhimpur—Sadiya (500′), ♀ 1.
Garo Hills—Tura (1,300′), ♂ 1, ♀ 1 ; Duragiri (1,600′), ♂ 1.
S. Kamrup—Rajapura (600′), ♂ 1.
Cachar Hills—Hatikhali (1,600′), ♂ 1 ; Langting (1,500′), ♂ 1, ♀ 1.
N. Kamrup—Matanga River (2,500′), ♂ 3, ♀ 1.
Mishmi Hills—Tiki (1,440′), ♂ 2, ♀ 2.
Dening (2,240′), ♂ 1, ♀ 2 ; Dreyi (6,000′), ♂ 1, ♀ 2.

This squirrel is common at Tura where the natives call it the Palm Marten.

Vernacular name—TA'RAI (Mishmi.)

(65) DREMOMYS LOKRIAH GARONUM Thos. subsp. nov.

The Orange-bellied Garo Hill Squirrel

1922. *Dremomys lokriah garonum*, Thomas, J.B.N.H.S., xxviii, p. 430.
Garo Hills—Tura (1,200′), ♂ 1 ; Duragiri (3,000′), ♀ 1.
Jaintia Hills—Konshnong (3000′), ♂ 1, ♀ 2.
Jowai (4,500′), ♀ 1.
Khasi Hills—Laitkynsao (2,500′), ♀ 2 juv.
S. Kamrup—Rajapura (600′), ♂ 1.

(66) DREMOMYS LOKRIAH SUBFLAVIVENTRIS, Horsf.

The Orange-bellied Mishmi Hills Squirrel

1843. *Sciurus subflaventris* McClelland, Gray. List., M.B.M., p. 144.
1922. *Dremomys lokriah subflaviventris*, Thomas, J.B.N.H.S., xxvii, p. 429.
Mishmi Hills—Dreyi (6,000′), ♂ 14, ♀ 18.

'The cry of this squirrel is quite distinct from any other, being a sharp 'squeaky chatter, continually repeated.'

The fur of one shot at Dreyi in June, 1921, was 'stained with the juice of a calladium fruit on which most squirrels and rats are at present feeding.' While *Callosciurus erythræus* seems to prefer the higher creeper-clad trees, *Dremomys lokriah* appears to be mostly a ground feeder, more frequently below than above the 15 ft. level from the ground, making free use of the creeper when moving about. Of the two, *Dremomys lokriah* seems to be the more active, though both can move with remarkable rapidity when occasion demands, e.g., whilst courting.—*H. W. W.*

(67) CALLOSCIURUS ERYTHRÆUS ERYTHRÆUS, Pallas.

Pallas' Squirrel

1778. *Sciurus erythræus*. Pallas, Glires, p. 377.
1891. *Sciurus erythræus*. Blanford, Mamm. No. 245 (partim).
Garo Hills—Tura (1,300′), ♂ 11, ♀ 2 ; Duragiri (3,000′), ♀ 1.
Khasi Hills—Tharia (1,100′), ♂ 1 ; Nangpoh (1,400′), ♀ 1.
S. Kamrup—Rajapura (600′), ♂ 7, ♀ 4 ; Kulsi (150′), ♀ 1.

Note by Mr. Wroughton—'This species established so long ago has in 'recent years been regarded with some doubt as to its exact identity. This fine 'series quite confirms Blyth's identification of the Garo Hills as the type 'locality and may now be confidently accepted as *erythræus*, Pallas.' Mr. Wells found the species fairly common at Tura in June, but very scarce everywhere in April. The Khasis snare them with a bamboo and gut trap, using jackfruit as a bait. Several caught at Sadiya in December. 1920, had their tails bitten off.

Vernacular name—RISANG (Khasi) ; KELKUTA (Garo).

(68) CALLOSCIURUS ERYTHRÆUS ERYTHROGASTER, Blyth.

The Manipur Squirrel

1842. *Sciurus erythrogaster*, Blyth, J.A.S.B., xi, p. 970.
1891. *Sciurus erythræus*. Blanford, Mamm. No. 245 (partim).
Jaintia Hills—Syndai (2,500′), ♂ 5, ♀ 1.
Khasi Hills—Moostah (2,000′), ♂ 1, juv. 1.

'I place this series under this name with some hesitation. On the whole 'they conform fairly well with the series representing *erythrogaster* in the 'Museum collection from S. Manipur. It is however, somewhat startling to 'find them living immediately close to the true *erythræus* type. Three of the 'six specimens have red ears, indication of their relationship to *erythræus* 'proper.'—*R. C. W.*

The two specimens from Moostah were added after the foregoing was written. They have redtipped tails but are otherwise similar to those from Syndai.

(69) CALLOSCIURUS ERYTHRÆUS NAGARUM, Thos. and Wrought.

The Naga Squirrel

(Synonymy in No. 20)

Naga Hills—Margherita (400′), ♀ 1 ; Powai (400′), ♂ 1.
Lakhimpur—Digboi (500′), ♂ 1, ♀ 3 ; Mikir Hills (600′), ♂ 1, ♀ 1.
N. Lakhimpur (1,500′), ♂ 1.
Cachar Hills—Langting (1,500′), ♀ 1.

These squirrels are most easily got at sunset as they then make for the tops of 'nahora' trees, on whose berries they feed.

(70) CALLOSCIURUS ERYTHRÆUS AQUILO, Wroughton.

The North-Eastern Squirrel

1921. *Callosciurus castaneoventris aquilo.* Wroughton, J.B.H.N.S., xxvii, No. 3, p. 601.
1921. *Callosciurus erythræus aquilo.* Wroughton, J. B. N. H. S., xxvii, No. 4, p. 775.
Lakhimpur—Dibong River (500′–800′), ♂ 7, ♀ 4.
Mishmi Hills—Tiki (1,440′), ♂ 2, ♀ 2 ; Dening (2,240′), ♂ 30, ♀ 24.
Dreyi (6,000′), ♂ 10, ♀ 9.

Mr. Wroughton finally placed this squirrel as a subspecies of *erythræus.* Mr. Wells notes in May at Dening 'several busy in a simul trees, carrying 'off mouthfuls of the cotton in various directions, some to holes in trees, and 'returning for more. They are very partial to a fruit similar in shape and 'size to an elephant apple but with a smooth skin and sweet pulp. *Hylobates* 'and *Ratufa* also eat this fruit.'

Vernacular name—TWAJA (Mishmi).

(71) CALLOSCIURUS ERYTHRÆUS WELLSI, Wrought.

Well's Squirrel

1921. *Callosciurus erythræus wellsi.* Wrought, J.B.N.H.S., xxvii, p. 775.
Jaintia Hills—Jowai (4,500′), ♀ 1 ; Shangpung (4,000′), ♂ 3, ♀ 4.
Konshnong (3,000′), ♀ 3.

'In view of the kaleidoscopic character of the patterns in this genus in 'Assam it seems to me every opportunity ought to be taken to give names 'to the local races wherever possible. In the present case the whitish tail 'tag, though only a minor character is so constantly present I have not 'hesitated to name this form as a definite local race.'

(72) TOMEUTES BLYTHI, Tytler

Blyth's Squirrel

1843. *Sciurus assamensis*, Gray. List Mamm., B.M., p. 143.
1854. *Sciurus blythi*, Tytler. A.M.N.H., 2, xiv, p. 172.
1891. *Sciurus lokroides*, Blanford. Mamm. No. 251 (partim).
1915. *Tomeutes lokroides*, Thomas, A.M.N.H., xv, p 385.
Naga Hills—Margherita (1,200′), ♂ 1, ♀ 1 ; Namdang (200′), ♀ 1 juv.
Sibsagar—Golaghat (300′), ♂ 2, ♀ 4 ; Kaziranga, ♀ 1.
Garo Hills—Rangapani (400′), ♂ 2 ; Tura (1,500′), ♂ 4, ♀ 2.
Duragiri (3,000′), ♂ 2, ♀ 1.
Khasi Hills—Laitkynsao (2,500′), ♂ 1, ♀ 1 ; Nongpoh (1,200′), ♀ 1.
Jaintia Hills—Syndai (2,500′), ♀ 1 juv.
Cachar Hills—Lanka (400′), ♀ 10 ; Tejnari (1,500′), ♂ 1.
Doiangmukh (600′), ♀ 2 ; Doiang River (1,600′), ♀ 1.
Lamsakhang (450–800′), ♂ 1, ♀ 1.
Hatikhali (1,500′), ♂ 2.
S. Kamrup—Rajapura (600′), ♀ 2.
N. Kamrup—Matanga River (2,500′), ♂ 3, ♀ 2 ; Boganadi (2,000′), ♂ 1, ♀ 1.
Angarakhata, ♂ 1, ♀ 2.

Note on the genus *Tomeutes* by Mr. Thomas :—

The study of these specimens has enabled me to clear up a point of nomenclature which affects all the *Tomeutes* of the *mearsi* type. In 1843 Gray used in his List the name of *Sciurus assamensis* but without a description, the name being therefore a *nomen nudum.* In 1854 Tytler described the squirrel of Dacca as *Sciurus blythi*, the typical specimens of which are now in the British Museum. In 1855 Blyth, writing of these squirrels used the name *Sciurus assamensis* with a secondary name or synonymy *S. blythi*, ignoring the fact that at that date *assamensis* was a *nomen nudum*, and added a description which has been accepted as giving validity to *assamensis*. But as his species *assemensis* is also *blythi*, the latter name, being earlier in date, must have preference. Both names have hitherto been provisionally put as synonyms of *Tomeutes lokroides*, Hodgs. But the present series includes some showing the thigh-patch whitish as in *mearsi*, instead of red as in lokroides.

Consequently if, as in Wroughton's synopsis, all the forms of the *lokroides* group with whitish or buffy patches are considered as one species with several sub-species, the name of the species must be changed to *blythi* and thus the three Burmese species would be

Tomeutes blythi virgo,
,, ,, *bellona*,
,, ,, *mearsi*.

Whether this typical *T. blythi* of Dacca and other parts of Assam is quite the same as the nearest sub-species *T. blythi virgo* is a question which it will be better to leave for decision until specimens from the intervening countries are available. The two are undoubtedly very close to one another, but, *blythi* seems on the average to be of a paler buffy above than *virgo*, while the front aspect of its thighs is of a bluey greyish, which is replaced in *virgo* by buffy. Provisionally therefore I should call all four forms sub-species of *Tomeutes blythi*.

(73) TOMEUTES STEVENSI, Thos.

Steven's Squirrel

(Synonymy in No. 20)

Naga Hills—Ledo (200′), ♂ 1.

'I identify this specimen as *stevensi* with very considerable hesitation. A 'very young specimen, provisionally identified as this species, taken by the 'Survey in July, North of Hkamti on the Chindwin River, shows in a slight 'degree the dark bluish head and feet and the ochraceous hip patch. On the 'other hand, the type taken in the Abor Miri country and two other speci'mens collected in the same area in February-March show no smallest sign 'of either of these characteristics. Here the matter must rest until more 'material is available for examination.' R.C.W.

(74) TAMIOPS MACCLELLANDI, Horsf.

The Himalayan Striped Squirrel

(Synonymy in No. 20)

Lakhimpur—Sadiya (240′-600′), ♂ 6, ♀ 3.
Garo Hills—Tura (4,000′), ♂ 1.
Cachar Hills—Langting (1,500′), ♀ 1.
Mishmi Hills—Tetsam (700′), ♂ 1; Tiki (1,440′), ♀ 2.
Dening (2,240′), ♂ 8, ♀ 7; Teju (3,000′), ♂ 1.
Dreyi (6,300′), ♂ 5, ♀ 3.

These little squirrels usually frequent the large open trunks of the *nahor* and *simul* trees. Very seldom are they found in trees of dense growth. The Mishmis say that this species does a fair amount of damage to their Indian corn when ripening, and only a well-aimed stone can dislodge them. They say that *C. erythrœus* also feeds on Indian corn but not to the same extent as it is more easily driven away. This *Tamiops* is very fond of a tree, *Dicellostyles jujubifolia*, some of these trees holding 3 or 4 of the squirrels at a time. A female killed June 21 at Dreyi contained two foetuses.

(75) BANDICOTA MEMORIVAGA, Hodgs.

The Smaller Bandicoot Rat

(Synonymy in No. 29)

N. Kamrup—Angarakhata (300′), ♂ 1.

Mr. Thomas has recently decided that *B. elliotina* and *nemorivaega* are identical and thus the former name should now be dropped.

(76) GUNOMYS BENGALENSIS, Gray and Hardwicke

The Bengal Mole Rat

(Synonymy in No. 19)

Sibsagar—Golaghat (300′), ♂ 9, ♀ 5 juv.
N. Kamrup—Angarakhata (300′), ♂ 38, ♀ 48.

Specimens of this Mole rat were collected in Kumaon and show in Report No. 15 as *G. tarayensis*, but later were included under *G. bengalensis*.

(77) DACNOMYS WROUGHTONI, Thos., subsp. nov.

The Mishmi Hills Giant Rat

1922. *Dacnomys wroughtoni*, Thomas, J.B.N.H.S., xxviii, p. 430.
Mishmi Hills—Dening (2 240′), ♂ 1 ; Dereyi (6,000′), ♂ 4, ♀ 1.
Mr. Thomas has dealt with this rat under ‘ Results ’ in above paper.

(78) RATTUS FULVESCENS, Gray.

The Chestnut Rat

(Synonymy in No. 15)

Naga Hills—Margherita (200′), ♀ 1.
Lakhimpur—Sadiya (500′), ♂ 1, ♀ 1 ; Kharjan (400′), ♂ 6, ♀ 2.
Digboi (200′), ♂ 2, ♀ 1.
Jaintia Hills—Jowai (4,500′), ♂ 1, ♀ 5 ; Konshnong (3,000′), ♂ 2.
Shangpung (4,000′), ♂ 1 ; Jarain (3,000′), ♀ 1.
Khasi Hills—Shillong (3,800′), ♀ 1 ; Cherrapunji (4,500′), ♂ 2.
Nongpoh (1,200′), ♀ 1 ; Laitkynsao (2,500′), ♂ 2, ♀ 5.
Mou Phlong (5,500′), ♀ 2.
S. Kamrup—Rajapura (600′), ♂ 1, ♀ 1.
Mishmi Hills—Dening (2,240′), ♂ 27, ♀ 22 ; Dreyi (6,000′), ♂ 6, ♀ 7.

(79) RATTUS LISTERI, Thos.

The Sikkim Giant Rat

(Synonymy in No. 26)

Mishmi Hills—Dening (2,240′), ♂ 2 ; Dreyi (6,000′), ♂ 3, ♀ 2.
Vernacular name—KN’ZUNG (Mishmi).

(80) RATTUS LISTERI GARONUM, Thos., subsp. nov.

The Garo Hills Giant Rat

1921. *Rattus listeri garonum.* Thomas., J.B.N.H.S., xxviii, p. 27.
Garo Hills—Tura (1,400′), ♂ 3, ♀ 2 ; Duragiri (3,000′), ♂ 1.
Jaintia Hills—Syndai (2,500′), ♀ 1 ; Nongpoh (1,200′), ♂ 1.

(81) RATTUS MANIPULUS, Thos.

The Manipur Rat

(Synonymy in No. 25)

Sibsagar—Golaghat (400′), ♂ 2, ♀ 2.
Jaintia Hils—Shangpung (4,000′), ♀ 1 ; Jowai (4,500′), ♀ 1.

(82) RATTUS NITIDUS, Hodgs.

The Nepal Shiny Rat

(Synonymy in No. 15)

Sibsagar—Golaghat (400′), ♀ 1.
Garo Hills—Tura (4,000′), ♀ 1 ; Duragiri (3,000′), ♀ 2 juv.
Jaintia Hills—Konshnong (3,000′), ♀ 4 ; Hotsprings (2,300′), ♂ 1, ♀ 3 juv.
Shangpung (4,000′), ♂ 2, ♀ 2 juv. 4.
Jowai (4,500′), ♀ 1 juv. 6.
Mishmi Hills—Denning (2,240′), ♂ 10, ♀ 14.

(83) RATTUS RATTUS SIKKIMENSIS, Hint.

The Darjiling Tree Rat

1918. *Rattus rattus sikkimensis*, Hinton, J.B.N.H.S., xxvi, p. 61.
Naga Hills—Margherita (200′), ♂ 2.
Lakhimpur—Digboi (250′), ♂ 3, ♀ 1 ; Lohit Valley (700′), ♂ 1.
Kazirang (250′), ♂ 3, ♀ 5 ; Kharjan (400′), ♂ 1.
Dibong River (500′), ♂ 1.

Garo Hills—Tura (1,440′–4,000′), ♂ 5, ♀ 5 ; Duragiri (3,000′), ♀ 2, juv. 2 ; Rangapani (400′), ♀ 2.

Khasi Hills—Cherrapunji (4,650′), ♂ 1, ♀ 1 ; Nongpoh (1,200′), ♂ 1, ♀ 4 ; Nongprieng (2,400′), ♀ 2.

Jaintia Hills—Konshnong (3,000′), ♂ 3, ♀ 5, juv. 2 ; Shangpung (4,000′), ♀ 2 ; Jowai (4,500′), ♂ 2, ♀ 1 ; Hotsprings (2,400′), ♀ 1 ; Jarain (3,000′), ♂ 1.

Mishmi Hills—Tiki (1,440′), ♂ 1, ♀ 4 ; Dening (2,240′), ♂ 12, ♀ 5 ; Dreyi 6,000′), ♂ 3, ♀ 5.

(84) RATTUS RATTUS TISTÆ, Hint.

The Himalayan Tree Rat

1918. *Rattus rattus tistæ*, Hinton, J.B.N.H.S., xxvi, p. 61.

Naga Hills—Margherita (200′), ♂ 12 (2 juv.), ♀ 2.

Lakhimpur—Sadiya (500′), ♂ 1; Digboi (250′), ♂ 1 juv. Kharjan (400′), ♂ 1; Kaziranga (250′), ♀ 2; Dibong River (500′), ♂ 3; Lohit Valley (700′), ♂ 4.

Sibsagar—Golaghat (250′), ♂ 8, ♀ 1.

Garo Hills—Tura (1,300′), ♂ 2; Duragiri (3,000′), ♂ 1.

Khasi Hills—Cherrapunji (4,500′), ♀ 1; Nongpoh (1,200′), ♂ 1.

Jaintia Hills—Konshnong (3,000′), ♂ 1, ♀ 1; Jowai (4,500′), ♂ 1, ♀ 1; Syndai (2,500′), ♀ 1; Jarain (3,000′), ♀ 1.

S. Kamrup—Rajapura (600′), ♂ 2, ♀ 10.

N. Kamrup—Angarakhata (300′), ♂ 11, ♀ 15.

Cachar Hills—Denning (2,240′), ♂ 24, ♀ 32 (2 juv.)

(85) RATTUS RATTUS WELLSI, Thos.

Well's Rat

1921. *Rattus wellsi*, Thomas, J.B.N.H.S., xxviii, p. 27.

Khasi Hills—Mou Phlong (5,500′), ♀ 1.

(86) MUS MUSCULUS, L.

The Common House Mouse

(Synonymy in No. 1)

Jaintia Hills—Shangpung (4,000′), ♂ 3, ♀ 9.

S. Kamrup—Rajapura (600′), ♂ 1, ♀ 9.

(87) MUS DUBIUS, Hodgs

The Nepal House Mouse

(Synonymy in No. 15)

Naga Hills—Margherita (1,500′), ♂ 1.

N. Cachar—Lanka (400′), ♂ 2, ♀ 1.

S. Kamrup—Rajapura (600′), ♂ 1, ♀ 2.

N. Kamrup—Angarakhata (300′), ♂ 14, ♀ 24.

This mouse has in some instances been classed as *M. manei*, in others as *M. urbanus*, but it now seems preferable to apply the name *dubius* to it until the whole group can be properly worked out.

(88) LEGGADA BOODUGA, Gray

The Southern Field Mouse

(Synonymy in No. 1.)

Sibsagar—Golaghat (300′), ♂ 9, ♀ 10, (4 juv.), in al. 4.

Jaintia Hills—Konshnong (3,000′), ♂ 6, ♀ 11; Shangpung (4,000′), ♂ 6, ♀ 8.

S. Kamrup—Rajapura (600′), ♂ 3, ♀ 8.

N. Kamrup—Angarakhata (300′), ♂ 33, ♀ 34.

(89) LEGGADA JACKSONIÆ, Thos., sp. nov.

Mrs. Jackson's Jungle Mouse

1921. *Leggada Jacksoniæ*, Thomas., J.B.N.H.S., xxvii, p. 596.

Garo Hills—Tura (3,000′), ♂ 2, ♀ 1.

Khasi Hills—Laitkynsao (2,000′), ♂ 1.

Jaintia Hills—Konshnong (3,000′), ♂ 1, ♀ 2.

Mishmi Hills—Dening (2,240′), ♂ 16, ♀ 9; Dreyi (6,000), ♂ 2, ♀ 5.

'This species is named in honour of Mrs. Jackson of Tura, to whose kindness 'and help Mr. Wells owes much of the success which attended his work in the 'Garo Hills.'—THOMAS.

(90) LEGGADA NAGARUM, Thos. sp. nov.

The Naga Jungle Mouse

1921. *Leggada nagarum*, Thomas, J.B.N.H.S., xxvii, p. 596.

Sibsagar—Golaghat (300′), ♂ 1.

Jaintia Hills—Konshnong (3,000′), ♂ 3, ♀ 4; Shangpung (4,000′), ♂ 3, ♀ 2.

Khasi Hills—Laitkynsao (2,000′), ♀ 1; Cherrapunji (4,500′), ♀ 1.

Mishmi Hills—Dening (2,240′), ♂ 18, ♀ 8; Dreyi (6,000′), ♀ 1.

(91) Leggada pahari, Thos.

The Sikkim Hill Mouse

(Synonymy in No. 23)

Lakhimpur—Sadiya (600′), ♂ 1.
Sibsagar—Golaghat (300′), ♂ 1.

(92) Vandeleuria dumeticola, Hodgs.

Hodgson's Tree Mouse

(Synonymy in No. 16)

Jaintia Hills—Konshnong (3,000′), ♀ 1, juv. 1.
Shangpung (4,000′), ♀ 4.
North Kamrup—Angarakhata (300′), ♂ 9, ♀ 6, in al. 1.
Mishmi Hills—Dening (2,240′), ♀ 1.

(93) Hadromys humei, Thos.

The Manipur Bush Mouse

1911. *Hadromys Humei.* Thomas, J. B. N. H. S., 4, xx, p. 999.
North Kamrup—Angarakhata (300′), ♀ 1.

(94) Golunda ellioti, Gray.

The Indian Bush Rat

(Synonymy in No. 1)

North Kamrup—Angarakhata (600′), ♀ 1.

(95) Chiropodomys gliroides, Blyth.

The Climbing Mouse

1855. *Mus gliroides*, Blyth, J. A. S. B., xxiv, p. 721.
1891. *Chiropodomys gliroides*, Blanford, Mamm. No. 270
Jauibia Hills—Konshnong (3,000′), ♀ 1.

‘ The type specimen of this species, a young animal with half its tail missing, has been lost. These specimens from practically the same locality may confidently be accepted as topotypes. Comparison with Tenasserim specimens, which we have hitherto labelled as *peguensis*, shows that there is no character which they are separable, so that *gliroides* as the older name must be used for both.’—R.C.W.

(96) Apodemus specious orestes, Thos.

The Szechuan Long-tailed Field Mouse

1911. *Apodemus speciosus orestes*, Thomas, Abster. P. Z. S., p. 49.
Mishmi Hills—Dening (2,240′), ♀ 1 ; Dreyi (6,000′), ♂ 6, ♀ 2.

(97) Eothenomys melanogaster Libonotus, Hinton, subsp. n.

Pere David'e Vole.

1871. *Arvicola melanogaster.* Milne Edwards, Nouv. Arch. Mus. vii. Bull., p. 23.
1891. *Microtus melanogaster.* Blanford. Mamm. No. 307.
1923. *Eothenonuys melanogaster libonotus*, Hinton, Aun. Mag. Nat. Hist. (9) xi, p. 151.
Mishmi Hills—Dreyi (6,000′), ♂ 3, ♀ 2, unsexed 1.

When revising the members, of the genus *Eothenosmys* this, the most south-western representative of that genus, was found to be worthy of recognition. The species is widely distributed in Southern China and Yunman.

(98) Rhizomys pruinosus, Blyth.

The Assam Bamboo Rat

(Synonymy in No. 36)

Khasi Hills—Cherrapunji (4,500′), ♂ 2, ♀ 6, juv. 4, in 13.
Laitkynsao (2,000′), ♂ 3, ♀ 2, unsexed 1.

(99) CANNOMYS BADIUS, Hodgs.

The Bay Bamboo Rat

(Synonymy in No. 20)

Garo Hills—Dura Bandar (1,600′), ♀ 2.
Jaintia Hills—Konshnong (3,000′), ♂ 15, ♀ 16.
Hotsprings (2,240′), ♂ 7, ♀ 2.
South Kamrup—Rajapura (600′), ♂15, ♀ 7.

(100) ACANTHION HODGSONI Gray.

The Crestless Himalayan Porcupine

(Synonymy in No. 27, also Report No. 37)

Sibsagar—Golaghat (300′), ♀ 2.
Garo Hills—Tura (1,440′), ♂ 1 juv.

(101) ATHERURUS ASSAMENSIS, Thos

The Assam Brush-tailed Porcupine

1921. *Atherurus assamensis,* Thomas. J. B. N. H. S., xxvii, p. 598.
Khasi Hills—Cherrapunji (4,500′), ♂ 1.
Mishmi Hills—Dreyi (6,000′), ♂ 1.
Vernacular name—DYNKHIAT (Khasi).

(102) LEPUS RUFICAUDATUS, Geoff.

The Common Indian Hare.

(Synonymy in No. 15)

Sibsagar—Golaghat (300′), ♂ 2 juv.
North Kamrup—Angarakhata (300′), ♂ 2, ♀ 6 (3 juv.)

The two immature specimens from Golaghat are here included, but are really too young for identification.

(103) CAPRICORNIS SUMATRENSIS RUBIDUS, Blyth.

The Aracan Serow

(Synonymy in No. 36)

Khasi Hills—Moosmai (4,000′), 1 horn only.
Mishmi Hills—Dreyi (6,000′), ♀ 1.
Vernacular names—RAMSAGEL (Garo) ; KHIAT (KHASI).

(104) BUDORCAS TAXICOLOR, Hodgs.

The Takin.

1850. *Budorcas taxicolor.* Hodgson, J. A. S. B., xix, p. 65, pl. p. 1-3.
1891. *Budorcas taxicolor.* Blanford. Mamm., p. 515.
Mishmi Hills—Dreyi (6,000′) ? 1 and 1 horn only.
See also a note on the *Mishmi Takin* in J. B. N. H. S., xxix, p. 550.
Vernacular name—TARKHAN (Mishmi).

(105) MOSCHUS MOSCHIFERUS. L.

The Indian Musk Deer

(Synonymy in No. 23)

Mishmi Hills—Dreyi (9,500′) ? 1, skull in.

(106) MUNTIACUS VAGINALIS, Bodd.

The Barking Deer

(Synonymy in No. 2)

N. Kamrup—Bogranadi (2,000′), ♂ 1 ; Matanga River (2,500′), ♂ 1.
Mishmi Hills—Dening, B 1 (juv.), ♀ 1.
Vernacular names :—CHOTA HARIN (Garo), SKEI (Khasi).

(107) HYELAPHUS PORCINUS, Zimm.

The Hog Deer

(Synonymy in No. 37)

Lakhimpur—Dibong River (500′), ♀ 2.
N. Kamrup—Angarakhata (300′) ,♀ 2.

(108) RUSA UNICOLOR, Bechs.

The Sambhar

(Synonymy in No. 5)

Assam, ♀ 1.

Note by Mr. Wells :—' I have been asked by a number of people in Assam why it is that Sambhur always have a sore place on the neck. It has been noticed on all Assamese species, but I cannot find out whether this is peculiar to other parts of India also.'

(109) MANIS PENTADACTYLA, L.

The Eastern Pangolin

(Synonymy in No. 37)

Sibsagar—Golaghat (300′), ? 1 flat skin.

' The Survey has taken this species from Mount Popa and Pegu, but it was ' listed as *aurita*.'—R. C. W.

SUPPLEMENT TO REPORT No. 41 :—

A small collection of mammals from the Chilka Lake, Orissa, made by Mr. H. W. Wells.

These specimens were sent along with those from Assam and the Mishmi Hills hence their description may be conveniently tacked on to the Report on those areas.

Chilka Lake is a pear-shaped expanse of water 44 miles long, of area 344 sq. miles in the dry season and 450 sq. miles in the rains, in the district of Puri, Bihar and Orissa. It lies between 19° 28′ and 19° 56′ N. and 85° 6′ and 85° 86′ E., and is separated from the Bay of Bengal by only a long sandy ridge about 200 yds. wide. The water in the rains is mainly fresh, but in the dry season is saline.

The collection numbers 17 specimens which belong to 8 genera in 9 species.

(1) PTEROPUS GIGANTEUS, Bruenn.

The Common Flying Fox

(Synonymy in No. 2)

Chilka Lake, ♂ 1, ♀ 2.

(2) SCOTOPHILUS WROUGHTONI, Thos.

Wroughton's Bat

(Synonymy in No. 2)

Chilka Lake, ♀ 1.

(3) SCOTOPHIOUS KUHLI, Leach.

The Common Yellow Bat

(Synonymy in No. 1)

Chilka Lake, ♀ 1.

(4) LYRODERMA LYRA, Geoff.

The Indian Vampire Bat

(Synonymy in No. 1)

Chilka Lake, ♂ 1, ♀ 1.

(5) ANATHANA PALLIDA, Lyon.

The Orissa Tree Shrew

1913. *Anathana pallida*, M. W. Lyon, Proc. U.S.N.M., lxv, p. 124.

Chilka Lake, ♂ 1, ♀ 1.

(6) CANIS INDICUS, Hodgs.

The Jackal

(Synonymy in No. 1 under *C. aureus*)

Chilka Lake, ♀ 1.

(7) FUNAMBULUS PALMARUM, L.

The Palm Squirrel

(Synonymy in No. 2)

Chilka Lake, ♂ 3, ♀ 2 (1 juv.).

(8) BANDICOTA Sp.

Chilka Lake, ♂ 1.

More specimens from this area must be obtained before the species can be definitely determined. It is probably a sub-species of *B. malabaricus*.

(9) RATTUS RATTUS ARBOREUS, Buch-Hamilton.

The Bengal Tree Rat

(Synonymy in No. 47)

Chilka Lake, ♂ 1.

SUPPLEMENT II. COLLECTION MADE BY MR. H. WHISTLER IN KANGRA.

1.	*Petaurista inornatus* from Upper Dharmsala ...	June 1, 1923.
2.	*Eoglaucomys fimbriatus* ♂ from Upper Dharmsala ...	,,
3.	*Ochotona roylei* ♀ from Kareri Lake, Kangra ...	,, 9, 1923.
4.	*Felis affinis* ♂ and ♀ from Dharmsala	,, 25, 1923.
5.	*Vulpes bengalensis* ♀ from Kangra Valley.	
6.	*Paguma grayi* juv. ♀ from Dharmsala	June 21, 1923.
7.	*Marmota himalayana* ♂ 2 juv. from S. Issoo, Lahul...	July 13, 1923.
8.	*Felis affinis* ♀ from Dhelu, Mandi State	,, 1, 1923.
9.	*Canis pallipes* from Lahul (10,500′).	

Mr. Pocock has kindly given the following note on this wolf :—

Canis pallipes. This wolf is of great interest. The jaws and teeth, retained in the skin, show that the animal was about the same size as the common Indian wolf, *C. pallipes*, but the coat, in accordance with the high altitude at which the wolf was shot, is extremely thick and woolly, exactly as in the larger Himalayan wolf, *C. lupus laniger*. It entirely contradicts Blanford's statement that *C. pallipes* may be distinguished from *C. lupus* by the coat being shorter and with little or no under fur. Though shot in July, the animal retained most of its winter coat. More specimens from this area would be most desirable.

REPORT No. 42, KASHMIR AND PUNJAB AREAS

BY

MARTIN HINTON AND OLDFIELD THOMAS, F.R.S.

(By permission of the Trustees of the British Museum)

COLLECTION	No. 42.
LOCALITY	Kashmir and Punjab.
DATE	July, August, 1921, and October, November, 1923.
COLLECTED BY	Major Stockley, D.S.O., O.B.E., M.C.

The specimens in this collection were obtained from four distinct areas :—

(1) SRINAGAR (5,600′)—with Tral (5,800′), Arapul Valley (6,300′), Sardallu (8,700′).

Major Stockley says in his notes that the specimens here all come from the 'edge of the cultivation in the Kashmir Valley. The Sardallu specimens were 'taken in a heavily forested nullah, the trees being mainly walnut, chestnut, 'birch, maples in the ravines, with a main forest growth of pine, and a strong undergrowth of skimmia.' The rats and mice were taken at two 'guzar' huts on the edge of the open grass at 9,000′.

(2) RAWALPINDI—with Campbellpore, Chakdulla (2,000′), Chak Lala (1,100′). Here collections were made on the N. E. portion of the Kala Chitta Range, mainly gravel and limestone with a considerable amount of thorn scrub, chiefly babul and ber, with tussocks of speargrass interspersed. Oleander

and pampas grass grow in the nullahs. The heat in summer is intense and water is scarce, being, confined in winter to only a few pools.

(3) BHATTU HISSAR (600′)—This is on the N. E. edge of the Bikanir desert, a country of sand dunes with canal irrigation. In this district Major Stockley noted a large increase in the number of Gerbils, probably due to improved conditions brought by the irrigation. But this increase has also caused increase in the number of foxes and birds of prey.

(4) KOHISTAN (Sind)—with Kotri (300′) at the S. end of the Khirthar Range and the Barun Valley, a barren country of rocks and sand dunes.

The 249 specimens obtained belong to 28 genera in 38 species as follows :—

(1) HIPPOSIDEROS CINERACEUS, Blyth.
The Little Leaf-nosed Bat
(Synonymy in No 37)

Bhattu Hissar—♀ 1.

(2) HIPPOSIDEROS FULVUS PALLIDUS, K. And.
The Bicoloured Leaf-nosed Bat
(Synonymy in No. 3, under *H. fulvus*)

Chak Lala (Rawalpindi), ♂ 5, ♀ 6.

(3) PLECOTUS WARDI. Thomas.
The Kashmir Long-eared Bat

1911. *Plecotus wardi*, Thomas, A. M. N. H. (8), vii, p. 209.

Tral (Kashmir)—♂ 2.

The type locality of this species is Ladak.

Major Stockley says that these two specimens 'entered the Tral shooting hut together, and I caught them in a butterfly net.'

(4) PIPISTRELLUS MIMUS, Wroughton.
The Common Dwarf Pipistrel
(Synonymy in No. 1)

Chak Lala—♂ 1 ; Bhattu Hissar, ♂ 8, ♀ 5.

(5) SCOTOPHILUS KUHLI, Leach.
The Common Yellow Bat
(Synonymy in No. 1)

Rawalpindi—Chak Lala, ♂ 3, ♀ 1 ; Toupi, ♀ 3.
Bhattu Hissar—♂ 5, ♀ 2.

(6) RHINOPOMA KINNEARI, Wroughton.
The Greater Indian Mouse-tailed Bat
(Synonymy in No. 3)

Ara (Rawalpindi)—♂ 3, ♀ 9.

(7) RHINOPOMA HARDWICKEI, Gray.
The Lesser Indian Mouse-tailed Bat
(Synonymy in No. 3)

Ara (Rawalpindi)—♂ 4, ♀ 2.

(8) PARAECHINUS BLANDFORDI, And.
Anderson's Hedgehog
(Synonymy in No. 24.)

Rawalpindi—Toupi, ♂ 1 ; Karung, ♂ 1.

(9) PACHYURA, sp.

Arapul Valley (Kashmir)—♂ 1 ; Bhattu Hissar—♂ 1.

(10) CROCIDURA RUBRICOSA, And.
Anderson's Assam Shrew
(Synonymy in No. 25)

Saradallu (Kashmir)—♂ 2, ♀ 1.

(11) CROCIDURA ILENSIS, Miller.

The Illi River Shrew

1901. *Crocidura ilensis*, Miller, Proc. Bio. Soc. Washington, xiv, p. 157.
Bhattu Hissar—♂ 1, ♀ 1.

The two specimens in this collection bear such a strong resemblance to *Crocidura ilensis* that the name may be provisionally applied to them. But the type specimens of this species come from Turkestan, a long way from the Punjab, and the other side of the Himalayas. Thus when more material is available for thorough examination, it may be necessary to reconsider the matter.

(12) FELIS AFFINIS, Gray.

The Jungle Cat

(Synonymy No. 1)

Kashmir—Tral, ♂ 1 ; Arapul Valley, ♀ 1.
Rawalpindi—Toupi, ♀ 1.

(13) FELIS BENGALENSIS, Kerr.

The Leopard Cat

1792. *Felis bengalensis*, Kerr. Animal Kingdom, p. 151.
Saradallu (Kashmir), ♀ 1.

(14) HERPESTES E. PALLENS, Ryley.

The Pale Grey Mongoose

(Synonmy in No. 12)

Chak Lala—♀ 2.

(15) HERPESTES AUROPUNCTATUS, Hodgs.

The Small Indian Mongoose

(Synonymy in No. 27)

Tral (Kashmir)—♂ 1.

(16) CANIS I. KOLA, Wroughton.

The Dekkan Jackal

(Synonmy in No. 1 under *O. aureus*)

Rawalpindi—Chak Lala, ♀ 1, Rawal, ♀ 1, Toupi, ♂ 1, ♀ 2.

(17) VULPES LEUCOPUS, Blyth.

The Indian Desert Fox

(Synonymy in No. 3)

Ara (Rawalpindi)—♂ 1, ♀ 1; Chakdalla (Campbellpore)—♂ 1, ♀ 1, Bhattu Hissar—♂ 2, ♀ 1.

(18) PETAURISTA INORNATUS, Geoff.

The Large Red Flying Squirrel

1844. *Pteromys inornatus*. Geoffroy. Voyage iv. Mamm., p. 62.
Sardallu (Kashmir)—♂ 1, ♀ 1.

(19) EOGLAUCOMYS FIMBRIATUS, Gray.

The Smaller Kashmir Flying Squirrel.

1837. *Sciuropterus fimbriatus*. Gray, Charlesworth, Mag. N.H., i, p. 584.
1889. ,, ,, Blandford, Mamm. No. 233.
Saradallu (Kashmir)—♂ 4, ♀ 1.

(20) FUNAMBULUS PENNANTI ARGENTISCENS, Wr.

The Northern Five-striped Squirrel

(Synonmy in No. 24)

Rawalpindi—Chak Lala, ♂ 2, ♀ 2 ; Rawal, ♂ 5, ♀ 2 ; Toupi, ♀ 1, Karung, ♀ 1.

(21) GERBILLUS GLEADOWI, Murray.
The Little Hairy-footed Gerbil
(Synonymy in No. 12)

Bhattu Hissar—♂ 1.

(22) CHELIONES HURRIANAE, Jerd.
The Indian Desert Gerbil
(Synonymy in No. 3)

Bhattu Hissar ♀—1 ; Kohistan (Sind)—♀ 4.

(23) TATERA INDICA, Hardw.
The Indian Gerbil
(Synonymy in No. 1)

Chak Lala, ♂ 2, ♀ 2 ; Rawal, ♂ 2. Jhalar (Campbellpore), ♀ 1
Bhattu Hissar—♀ 2 ; Kohistan (Sind), ♂ 1, ♀ 1.

(24) GUNOMYS BENGALENSIS, Gray and Hardw.
The Bengal Mole Rat
(Synonymy in No. 19)

Chak Lala, ♂ 8, ♀ 5.

(25) GUNOMYS WARDI, Thos.
The Kashmir Mole Rat

1908. *Gunomys wardi*, Thomas. J.B.N.H.S., xviii, 4, p. 745.
Srinagar (Kashmir), ♂ 2.

(26) RATTUS ALEXANDRINUS, Geoff.
The Egyptian House Rat

1812. *Mus alexandrinus*, Geoff. Desc. de l'Egypte Hist. Nat., ii, p. 733.
1881. ,, ,, Thomas. P.Z.S., p. 533.
Chakdalla, ♂ 1.

(27) RATTUS RATTUS RUFESCENS, Gray.
The Common Indian Rat
(Synonymy in No. 1)

Chak Lala, ♂ 6, ♀ 10.

(28) RATTUS VICEREX, Bonh.
The North Asian Rat
(Synonymy in No. 15)

Rawalpindi—Talala (1,800′), ♂ 2, ♀ 1.
Kashmir—Tral, ♂ 1, ♀ 2 ; Arapul Valley, ♂ 2, ♀ 1 ; Saradallu, ♂ 3, ♀ 1 ; Chasma Shahi, ♂ 2, ♀ 2 (juv.)
Chakdalla, ♂ 1, ♀ 1.

(29) MILLARDIA MELTADA, Gray.
The Soft-furred Field Rat
(Synonymy in No. 1)

Bhattu Hissar, ♂ 2, ♀ 1.

(30) MUS GERBILLINUS, Wroughton.
The Sind Wild Mouse
(Synonymy in No. 24)

Rawalpindi—Chak Lala, ♂ 1 ; Ar A ♀ 1.
Campbellpore—Chakdalla, ♂ 1 ; Jhalar, ♀ 1.
Bhattu Hissar, ♂ 2.

(31) MUS HOMOURUS, Hodgs.

Himalayan House Mouse

(Synonymy in No. 15)

Kashmir—Srinagar, ♂ 2 ; Sardallu, ♂ 2.
Bhattu Hissar, ♂ 1.

(32) MUS URBANUS, Hodgs.

The Nepal House Mouse

(Synonymy in No. 15)

Bhattu Hissar, ♂ 1, ♀ 1.

(33) APODEMUS S. GRISEUS, True.

The Kumaon Long-tailed Field Mouse

(Synonymy in No. 15)

Kashmir—Saradallu, ♂ 10, ♀ 7 ; Sutor, ♀ 1.

(34) ACOMYS FLAVIDUS, Thos.

The Indian Spring Mouse

1917. *Acomys flavidus*, Thomas. J.B.N.H.S., xxv, p. 205.
Kohistan (Sind), ♀ 1.

(35) MICROTUS (HYPERACRIUS) WYNNEI, Bland.

The Murree Vole

1880. *Arvicola wynnei*, Blandford, J.A.S.B., xlix, pt. 2, p. 244.
1889. *Microtus wynnei*, ,, ,, Mamm. No. 303.
Saradallu (Kashmir), ♂ 1, ♀ 5.

(36) LEPUS DAYANUS, Blandf.

The Sind Hare

(Synonymy in No. 3)

Rawalpindi—Chak Lala, ♂ 1, ♀ 1 ; Toupi, ♂ 4, ♀ 2.

(37) OVIS VIGNEI CYCLOCEROS, Hutton.

The Afghan Urial

(Synonymy in No. 32)

Taliala, (1,800′), Rawalpindi, ♂ 1, ♀ 1.
Nilo, N. of Jhelum, ♂ 2.

(38) GAZELLA BENNETTI, Sykes.

The Indian Gazelle

(Synonymy in No. 1)

Rawal, ♂ 1.

INDIAN DRAGONFLIES

BY

MAJOR F. C. FRASER, I.M.S., F.E.S.

Part XXIV

With 2 plates and 5 text figures

(*Continued from page 171 of Vol. XXXI*)

Genus—BURMAGOMPHUS Williamson.

Burmagomphus—Will., Proc. U. S. Nat. Mus., vol. xxxiii, pp. 298-301, 1908. Laid., Rec. Ind. Mus., vol. xxxiv, p. 399, 1922.

A genus of medium-sized Gomphine dragonflies, coloured black, vividly marked with citron yellow or greenish yellow. Species studied :—

B. pyramidalis Laid., *B. sivalikensis* Laid., *B. siamensis* sp. nov., *B. laidlawi*, Fras., *B. cauvericus* sp. nov., *B. hasimaricus* sp. nov., and *B. V—flavum* sp. nov. In addition to these, I have the able descriptions of *B. williamsoni* (Will.) nom. nov., *B. insularis* Laid., *B. jacobseni* Ris, and the somewhat brief description of the geno-type, *B. vermiculatus* (Mart.), to assist me in a study of the genus as a whole.

Of the eleven species quoted above, seven are found within Indian limits, whitst *siamensis* comes from Siam, as the name implies, *vermiculatus* from Tonkin, *insularis* from Borneo and *jacobseni* from Java.

B. siamensis and *V-flavum* are known only from females, most of the remainder from both sexes.

The thoracic markings denote a cleavage into two groups, which is further supported by the character of the genitalia. The first of these groups,—*vermiculatus*, is well-defined, and especially characterized by the fusion of the upper half of the antehumeral thoracic stripe with the lower end of the humeral, so as to form a single vermiform stripe, or one with a bayonet-twist at its middle. The lower half of the antehumeral stripe is absent, whilst the upper half of the humeral is represented by a small isolated spot.

In the second group, the thoracic markings are by no means so uniform and vary widely in the species ; the hamules are built on the same plan as in the first group, although differing more widely than is found to be the case in that group.

Possibly some of the forms in group *vermiculatus* are mere races of that species, but as we do not know the shape of the genitalia of the geno-type, I prefer to give all specific rank. I am justified in this by the example afforded by *hasimaricus*, which is almost identical in its markings to *Pyramidalis*, which again is almost identical in its markings to *vermiculatus*, and yet the genitalia of *hasimaricus* is widely different to that of *pyramidalis*. I had actually classed the former as a race of the latter, until I discovered this important difference.

All species, so far as known, are jungle habitants, frequenting mountain streams in ravines, in montane or submontane areas of the tropics of Southern Asia. Males are found resting on stones in midstream or on rocks or foliage beside these waters. Females rest high in trees, descending only for purposes of ovipositing. Larvæ are of the torpedo-shape, resembling rather closely those of *Onychogomphus* ; all breed in running water.

Wings : reticulation rather open ; nervures between *Mi-iii* and *Miv* in forewing 2, only 1 in the hind; pterostigma braced, rather swollen, about one-fourth the length of distance between node and distal end of pterostigma, rather longer and narrower in the hind wing ; trigones, hypertrigones and subtrigones all entire, trigone in forewing with costal side shortest, basal and distal sides nearly equal, the latter usually slightly angulate at its middle ; trigone in hind wing rather elongate, its basal side shortest, costal and distal

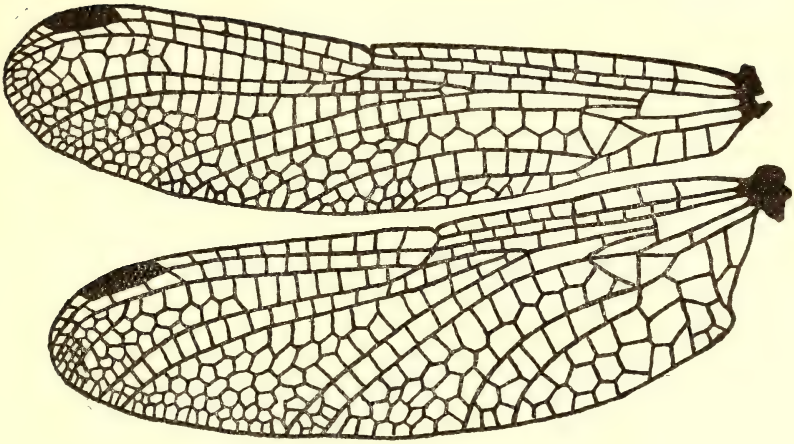


Fig. 1. Wings of *Burmagomphus pyramidalis* Laid. ♂

sides subequal; discoidal field in forewing 2-celled to beyond level of node; *Miii* and *Miv* distinctly sinuous in forewing; *Cui* and *Cuii* in hindwing parallel nearly to border of wing, dilated in the fore; *Cuii* in forewing subpectinate, 3 rows of cells between it and border of wing; 1 to 2 rows of postanal cells in forewing, 3-4 in the hind, where the first postanal cell is entire and extends basad to middle of subtrigone; only 2 rows of cells between *Mi* and *Mia*; only 1 cubital nervure in all wings; arc at the 2nd antenodal nervure; sectors of arc parallel or slightly divergent from origin; the 1st and 4th the primary antenodals; no basal incomplete antenodal nervure; anal triangle 3-celled; base of wing slightly excavate; tornus angulate.

Head moderately large, face sloping, frons rounded, occiput variable, notched, rounded or spined at centre.

Legs moderately long, hind femora extending to slightly beyond the apical border of 2nd abdominal segment, armed with closely set, small, evenly-sized spines.

Abdomen tumid at base, thin and cylindrical as far as apical half of segment 7 from where it dilates considerably as far as 9, but without lateral wings, segments 7 to 10 diminishing gradually in length, 10 very small. Oreillets moderately large.

Anal appendages resembling those of *Gomphus*, of equal length and almost equally divaricate, both superior and inferior black.

Genitalia. Lamina depressed, arched or notched; anterior hamules short stillettes; posterior hamules broad, flattened or curled plates with an anterior robust spine, and often with 1 or more accessory marginal spines; lobe prominent, globular or funnel-shaped.

Geno-type.—*B. vermiculatus* (Mart.).

Group I. *vermiculatus*.

Burmagomphus pyramidalis Laid., Rec. Ind. Mus., vol. xxiv, pp. 400 and 401, 1922; Fras., Rec. Ind. Mus., vol. xxvi, p. 476, 1924.

Male: Abdomen 30 mm. Hindwing 23-24 mm.

Head: labium yellow, margined with black; labrum greenish-yellow with its anterior border narrowly, and base, more broadly black, and a short medial prolongation of black running from the base line; bases of mandibles black, the genæ, anteclypeus and postclypeus black, the latter marked with a median spot and a lateral triangular larger spot greenish-yellow; frons greenish-yellow, its base above black; vertex and occiput black, the latter slightly concave.

Prothorax black marked with a greenish-yellow spot on each side.

Thorax black marked with greenish-yellow as follows :—a complete mesothoracic collar, a small spot in the alar sinus above, a sinuous dorsal stripe running from near the alar sinus above, down and out to the second pair of legs. This stripe is formed by a union of an antehumeral with a humeral stripe, the upper antehumeral portion is very narrow and broadens abruptly at its middle where it takes a bayonet turn outwards to fuse with the humeral portion. A small upper humeral spot representing the upper part of an obsolete humeral stripe ; the sides broadly. The latter marked with a narrow, complete stripe on the postero-lateral suture and an incomplete one on the lower half of the anterior suture.

Legs black, coxæ yellow, as also the inner surface of the anterior pair of femora ; armed as for genus.

Wings hyaline often slightly tinted with saffron at the bases. Nodal index $\frac{10\text{–}12}{10\text{–}9}\Big|\frac{13\text{–}9}{9\text{–}9}$, $\frac{10\text{–}14}{11\text{–}9}\Big|\frac{12\text{–}11}{9\text{–}10}$, pterostigma yellow between black nervures ; 4 rows of postanal cells in hindwing.

Abdomen black marked with yellow as follows :—segment 1 with a triangular mark on dorsum at apex and a broad baso-lateral spot, 2 with a lanceolate dorsal stripe not quite reaching the apical border, and a very broad spot on the sides, 3 to 8 with narrow basal rings, rather broader on 7 and very narrow on 8 where however it is produced laterally as an elongated spot on the basal half of segment, segment 3 has also a large baso-lateral triangular spot confluent with the dorsal ring, segment 8 often with an additional apico-lateral spot, 9 has nearly its apical half yellow, but laterally this mark much narrower and confluent with a ventral bordering of yellow ; at its apex, at the middorsum a very robust spine, also yellow. (This spine has been mentioned by Martin in his short description of *vermiculatus*, but has escaped the notice of Laidlaw and of Williamson ; it appears to be a group character of *vermiculatus*.) Segment 10 entirely black.

Anal appendages black, superiors as long as segment 10, divaricate, tapering to a point, to the outer side of which is a stunted spine which gives a bifid appearance to the apices when viewed a little to one side. Inferior deeply cleft into two widely divaricate branches, which are rather longer than the superiors, and taper to a fine point, the apex of which curls rather abruptly upward.

Genitalia. Lamina depressed, broadly arched ; anterior hamules short, stillette-shaped with an inconspicuous backwardly-turned point ; posterior hamules very robust, broad, projecting markedly, pyriform, with a robust forwardly directed spine at apex ; lobe tumid, rounded, shallowly grooved in front.

Female. Abdomen 33 mm. Hindwing 27 mm.

Similar to the male, differs as follows :—The basal ring on segment 2 more regular and the yellow on its sides more extensive ; on the sides of segment 3 an elongate yellow spot, not confluent with the basal triangular spot ; segment 9 with only its apical fourth yellow and 10 with a pair of small dorso-apical spots.

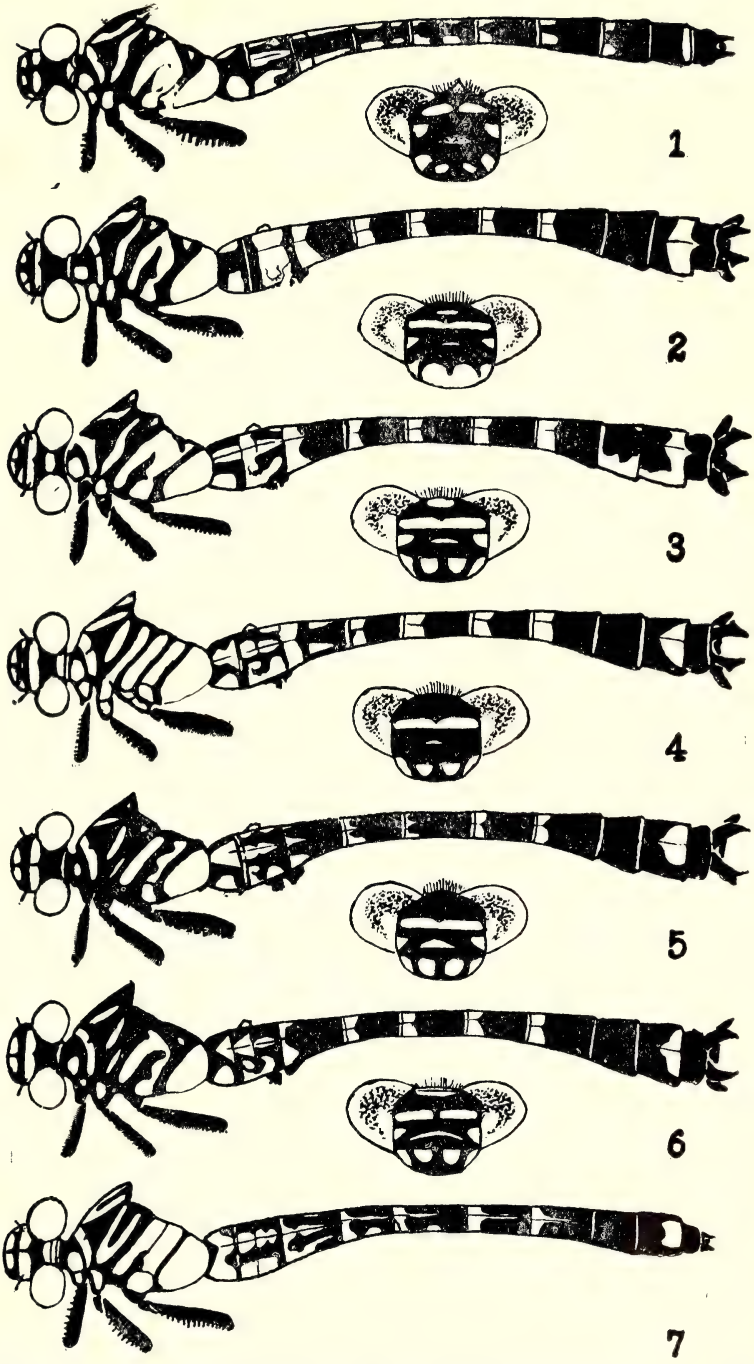
Anal appendages small, conical, black, the protuberance between them yellow. Nodal index usually slightly higher. Vulvar scale glossy back, its apical third broadly bifid, the whole scale broadly triangular.

Distribution. Confined to Western India from south-west of the Deccan to Malabar, Coorg, Nilgiris, Kanara and Poona. Specimens from the latter place have the ground colour bright citron yellow, whilst from the moister zones of Malabar and Coorg, specimens have the ground colour more grass-green. The measurements given are of those from Poona, from where the type comes, those from the Western Ghats are from 3 to 4 mm. larger. They emerge from May to July in the latter parts, and from August to September at Poona. At the latter place I took most specimens settled fairly high up on evergreens near the river-side, whilst in the Western Ghats they are rarely seen except settled on rocks in mid-stream, and then only during bursts of sun shine. It is a shy, jungly creature, but not uncommon. Type in the Indian Museum.

Burmagomphus williamsoni Will. nom. nov. *Burmagomphus vermiculatus* Will., l.c., pp. 301, 303, Figs. 27, 28 and 29. 1908.

Male : Abdomen 28 mm. Hindwing 23 mm.

Closely resembles *pyramidalis* Laid., and *vermiculatus* Mart., for the latter



Lateral views of :—1. *Burmagomphus siamensis* sp. nov. ♀ 2. *Burmagomphus vermiculatus* (Mart). ♂ 3. *Burmagomphus pyramidalis* Laid. ♂ 4. *Burmagomphus sivalikensis* Laid. ♂ 5. *Burmagomphus laidlawi*. Fras. ♂ 6. *Burmagomphus cauvericus* sp. nov. ♂ 7. *Burmagomphus V-flavum* sp. nov. ♀

of which Willamson mistook this species. Differs from the former as follows :—Nodel index $\frac{8\text{–}10}{10\text{–}8}\Big|\frac{10\text{–}9}{8\text{–}8}$; labium not bordered with black ; labrum black with two large transversely elongate greenish spots at base ; mesothoracic collar slightly interrupted ; segment 2 with a long trilobed dorsal stripe ; narrow middorsal lines on segment 3 to 5 confluent basad with the basal rings ; segment 6 with a fine triangular dorsal spot at base ; genitalia specialized, posterior hamules broader, the spine more forward and smaller, and in addition two smaller spines on the outer border, lobe more prominent and more deeply notched.

Distribution. Burma. Described by Williamson from 3 males collected by Mr. R. A. Earnshaw. Type in Williamson collection. Female unknown.

Burmagomphus hasimaricus sp. nov.

Male : Abdomen 32 mm. Hindwing 27 mm.

Closely similar to *B. pyramidalis* Laid., but differs markedly by its genitalia. I note also the following differences :—midlobe of labium entirely black, labrum black with two elongate basal spots as in *williamsoni*, a mere vestige of the central spot on epistome and the large lateral spots against the eyes on the same structure entirely absent ; occiput and vertex entirely black, the large yellow spot here entirely absent, the borders of the occiput flat, not curled up as in *pyramidalis* ; the mesothoracic collar very finely divided ; the mid-lateral black stripe longer and nearly confluent with the short oblique stripe which runs towards the hinder stripe above ; pterostigma darker, pale brown ; a trilobed dorsal stripe on segment 2 and a fine middorsal line on 3 and 4, segment 8 entirely black ; anal superior appendages longer and finer, and without the outer spine, the outer side bevelled for its apical two-thirds, inferior appendage with the apices of branches scarcely upturned. Posterior hamules very bulky, the base a little constricted, the apical portion produced squarely back with distinct angles, its anterior spine more robust and directed more forward.

The female differs less in some respects and more in others than does the male from *pyramidalis*. The labrum is similar to *pyramidalis* and the large triangular lateral spots of epistome are present. The median spot on this organ is present as two fine transversely linear spots. The occiput is entirely black. The thorax is much less broadly black than in the male and approximates to *pyramidalis*, the lateral stripes being very fine and the median short and not nearly reaching to the upper segmental stripe.

The dorsal surface of segment 2 is entirely without the middorsal stripe and has only a basal ring and the sides broadly yellow, segments 3 to 6 have the basal rings produced slightly apicad, and in addition to the lateral elongate spot on segment 2, there is a similar, but smaller one on 3. Segment 8 is unmarked as in the male. The protuberance between the anal appendages is black. Lastly the vulvar scale is longer and is cleft very deeply, ending in two long fine spine-like processes, very different to what is seen in *pyramidalis*.

Distribution. One male and two females from Mr. H. V. O'Donel, from Hasimara, Duars, Bengal. Mr. O'Donel in sending me these specimens remarks that the species is very close to *pyramidalis*, but differs by having a dorsal stripe on the abdomen. The differences in the genitalia of both sexes are however sufficient to constitute a good species. Type at present in the Fraser collection.

Burmagomphus siamensis sp. nov.

Female : Abdomen 27 mm. Hindwing 24 mm.

It is convenient to describe this new species here, as it forms a connecting link between *williamsoni* and the genotype *vermiculatus*, and because, on account of its proximity to Lower Burma, it may possibly extend to Burma, like many other Siamese species.

It resembles *williamsoni* closely, but differs as follows :—Nodal index $\frac{9\text{–}12}{9\text{–}8}\Big|\frac{12\text{–}9}{8\text{–}8}$; labrum greenish-yellow, its base and anterior border bordered with black and its centre traversed by a narrow black line cutting the yellow into two very large spots ; mid-spot and lateral spots on epistome small and widely separated by the black ; occiput yellow, raised into a long prominent median spine at its hinder border and with a smaller black spine at either end against the eyes but not quite on the free border. Thoracic markings similar but the mesothoracic collar complete. Abdomen with a fine middorsal stripe on segment 2 continued as a very fine line on 3 and 4; a complete lateral broad stripe on 3 finely divided by the jugal suture, a similar on segment 4, but broadly broken at the level of the jugal suture and incomplete at the apical end, the basal rings on 5, 6 and 7 produced laterally for a short distance, and on 5 a medial lateral linear spot, 8 with two basal dorsal lunules narrowly connected over the dorsum, 9 with its apical border finely yellow. Vulvar scale broadly triangular, cleft to its base into two triangular processes.

Distribution. Bangkok, Siam. A single female in the Fraser collection. This specimen may of course be the female of *williamsoni* but the yellow occiput and the restricted markings on the face seem to separate it from that species. The genotype *vermiculatus* differs from it by its larger size,—abdomen 30–33 mm., hindwing 24 mm.; the nodal index is higher, 14 to 15 antenodal nervures in forewings, and 9 to 11 postnodals; 10 antenodals in hindwing and 9 to 11 postnodals. The lateral spots on the epistome are absent as in *hasimaricus*. The mesothoracic collar is interrupted; the first lateral black stripe is said to be forked above, but I think that this is an error, the second being meant, as in all other species. Lastly there are no lateral markings on any of the segments after 2. *B. vermiculatus* comes from Tonkin.

Group *laidlawi*.

In this group I place all those species in which the antehumeral and humeral stripes are not combined to form an oblique sinuous stripe and in which the male does not bear a dorsal spine at the apex of segment 9.

Burmagomphus laidlawi Fras. *Gomphus* sp. Fras., Rec. Ind. Mus., vol. xxiv, p. 419, 1922; id. ib., vol. xxvi, pp. 475, 476, 1924.

Male: Abdomen 33 mm. Hindwing 27 mm.

Head: labium with midlobe black, lateral lobes greenish white; labrum black marked with two transversely oval yellow spots; bases of mandibles yellow; ante—and post-clypeus black with a small linear spot, variably present, at lower border of latter; frons bright greenish yellow, rest of head black. Occiput slightly raised at the middle, fringed with long black hairs. Eyes bottle green.

Prothorax black with a large lateral spot and an anterior collar of yellow.

Thorax marked with greenish yellow or greenish white as follows:—a complete mesothoracic collar, oblique antehumeral stripes extending from alar sinus but not meeting the mesothoracic collar, a minute upper humeral point and the vestiges of a lower humeral stripe, the alar sinus and the whole of the sides, which latter are marked with two narrow black stripes on the sutures. These two stripes occasionally confluent above and below, thus enclosing an elongate yellow spot, but usually only the upper part of stripes are confluent. In one specimen from South Kanara, the stripes are so confluent as to almost obliterate the included yellow, and the labial spots are also absent in the same specimen.

Wings hyaline, slightly tinted with yellow at the base; 4 rows of postanal cells in hindwing; pterostigma dark brown, over 4 to 5 cells; nodal index $\frac{13\text{–}16 \mid 15\text{–}12}{11\text{–}10 \mid 10\text{–}12}$, $\frac{10\text{–}14 \mid 12\text{–}10}{10\text{–}9 \mid 10\text{–}11}$.

Legs black, anterior femora yellow internally, hind femora armed as for genus.

Abdomen black marked with yellow as follows:—segment 1 with a dorsal spot extending from base to apex, and its sides broadly, 2 with a bilobed middorsal stripe extending from base to apex, and the sides broadly, the subdorsal black descending as a vertical stripe behind the oreillets, segment 3 with the middorsal carina finely yellow, but usually only at the base, and a large baso-lateral spot, segments 4 to 6 with basal dorsal triangular spots and baso-lateral lunules confluent with the former, 7 with a broad basal ring occupying about one-fourth the length of segment, 8 unmarked or with a minute basal dorsal triangular spot, and in some with a still smaller apical spot, 9 with its apical half yellow, this colour sometimes extending irregularly along the dorsal crest, 10 unmarked.

Anal appendages black, both superiors and branches of inferior markedly divaricate, the inferior more so than the superiors. The apices of superiors long and thin and twisting in and a little down. Branches of inferior curling upward. Slightly shorter than segment 10.

Genitalia : lamina very narrow, very depressed ; anterior hamules short stillettes with an inconspicuous hook at apex ; posterior hamules very robust, projecting, squared and with a robust spine on the anterior corner projecting forward, a smaller one on the hinder angle projecting vertically. In some specimens there are 2 or 3 such posterior spines, but usually only one ; lobe very tumid and prominent, rounded, deeply cleft.

Female : Abdomen 32 mm. Hindwing 29 mm.

Very similar to the male, markings better defined. The humeral spot larger and continued as a broken line below, or similar to the male. Often a small spot on each side of the postclypeus. A very prominent horn on each side of head just behind the lateral ocelli ; occiput simple, nearly straight. The baso-lateral spot on sides of segment 3 continued after a slight interval, by a broad lateral stripe which extends nearly to apex of segment ; 8 with a very fine basal yellow ring, the yellow on 9 more restricted, 10 with its apical border lined with yellow. The superior anal appendages small, conical, pointed, black with a yellow spot above. Vulvar scale very broad, of even width, slightly notched at its middle, glossy black. (The Kallar female has segment 10 unmarked, and the horns on vertex are poorly developed). Wings in all adult females are enfumed pale brown, tenerals are rather deeply saffronated at the base.

Distribution. Western Ghats of India only. The original pair were taken *in cop*, flying along the bed of the Kallar river, Nilgiris, 2,000 ft., August 13, 1922. A female was taken at Gudalur, Nilgiri-Wynaad, 3,500 ft., and several males in Coorg and South Kanara during September 23. Its habits are similar to *pyramidalis*, with which it is occasionally found in company. Type in the British Museum.

Burmagomphus cauvericus sp. nov.

Male : Abdomen 35 mm. Hindwing 28 mm.

Very similar to *laidlawi*, differs as follows :—Midlobe of labium greenish, narrowly bordered with black ; a small triangular spot of greenish yellow on each side of postclypeus ; the upper humeral spot usually entirely absent, or if present, then a mere point ; lateral markings on thorax similar to those of *pyramidalis*, the stripe on the first suture is incomplete above, but runs up higher than it does in *pyramidalis*, and is almost confluent with a short oblique stripe which runs back from below forewing to join the upper part of the stripe on the second suture, enclosing a small spot above. In some specimens this short stripe is so broadly confluent, that the stripe on the second suture appears to be expanded above, and marked with a tiny point of citron yellow. The hinder border of metepimeron bordered above narrowly with black. Segment 2 with a dorsal lanceolate spot extending to about the middle of segment 10 with a fine vestigial line along its middorsal ridge. Genitalia ; posterior hamules less broad than in *laidlawi*, the anterior spine smaller and two smaller spines situated close together at hinder angle. Lobe smaller, less deeply notched.

Female : Abdomen 35 mm. Hind wing 31 mm.

Very similar to the male, differs as follows :—The black markings on sides of thorax more restricted, so that the enclosed spot above the front of second lateral suture is very large and the black stripe on the suture at this level is reduced to a fine line, the basal ring on segment 3 produced laterally as a broad triangular spot, followed by a large elongate lateral isolated spot, segment 4 with a similar lateral but smaller spot. Rest as for male. Segment 8 in both sexes unmarked. Vulvar scale more broadly notched so that its border exhibits two broad triangular processes. Anal appendages entirely black.

Distribution. Coorg only, along the banks and tributaries of the river Cauvery. This handsome species may be immediately recognized by the combination of the anterior thoracic markings of *laidlawi* with the lateral thoracic markings of *pyramidalis*. The occiput of the female is notched in the middle and rounded on either side of the notch. The horns on the vertex are shorter and with a broader base and are situated a little to the outer side of the hinder ocelli, instead of directly behind them. Type in the British Museum.

Burmagomphus sivalikensis Laid. l. c., pp. 401, 402, 1922.

Male. Abdomen 34 mm. Hindwing 25 mm.

Head : labium pale greenish white, the midlobe narrowly bordered with black ; labrum black marked with two very large transversely elongate greeny-white spots ; bases of mandibles coloured similarly ; anteclypeus black with a median linear spot of palest green and a large spot on each side the same colour ; frons black in front, greenish above, its base narrowly black, this colour prolonged forwards at the middle as a very short triangle ; vertex black ; occiput greenish white, slightly notched at its middle and convex on either side, fringed with pale hairs.

Prothorax black with an anterior collar, a large lateral spot and a small median dorsal spot citron yellow.

Thorax black marked with greenish-yellow as follows :—a mesothoracic collar finely divided by the dorsal black carina, very oblique long antehumeral spots well separated from the collar below and the alar sinus above, a long irregular humeral stripe constricted just below its upper part and continued below on to the base of the middle pair of legs. Laterally two narrow black lines on the lateral sutures, rather narrower than the black stripe separating the humeral stripe from the yellow stripe following it. The first lateral stripe is sinuous above and the second constricted above and angulated backwards below. Lastly there is a fine black line on the upper and back part of metepimeron.

Legs black, the inner surface of the anterior pair of femora yellow, armature of hind femora as for genus.

Wings hyaline ; pterostigma pale yellowy brown between thick black nervures, over 3 to 4 cells ; nodal index $\frac{7\text{–}12}{6\text{–}9}\Big|\frac{13\text{–}8}{9\text{–}7}$.

Abdomen black marked with pale citron yellow as follows :—segment 1 with a triangular spot on dorsum, its base against the apical border of segment, segment 2 with a lanceolate middorsal stripe extending from base to apex, sides of these two segments broadly, the second segment with an extension of black behind the oreillet and a narrow black apical ring, segments 3 to 7 with a narrow basal ring, rather broader on 3 and, on all, constricted at the middorsum by invasion of black, 3 has also an elongate lateral spot each side, segment 8 unmarked, 9 with a very large triangular spot on its apical three-fourths, more extensive on dorsum than on sides, 10 unmarked.

Anal appendages black, as long as segment 10, superiors nearly parallel, pointed at apex and with a stout stunted spine near the apex on outer side as in *pyramidalis*, which gives a bevelled appearance to this part of appendage. Inferior deeply cleft into two very widely divaricate branches with upturned apices.

Genitalia : lamina slightly raised, hood-like, deeply cleft ; anterior hamules short stillette-shaped organs ; posterior broad and robust, longer and narrower than in other species and tapering outwardly to a blunt point, from the apex of which springs a long fine spine ; lobe projecting, shaped like the spout of a milk-jug.

Female unknown.

Distribution. Dehra Dun and Hasimara, Duars, Bengal. The above description differs in several respects from that of Dr. Laidlaw's, which was made from an old broken and faded specimen. The present description has been made from a fresh specimen sent me by Mr. H. V. O'Donel, who took it at Hasimara ; its ground colours are a beautiful greenish-yellow, in strong contrast to the dirty orange yellow of the type from Dehra Dun. The latter in the British Museum.

The character of the genitalia, as well as its markings, will easily distinguish this species from others of the genus.

Burmagomphus V-flavum sp. nov.

Female : Abdomen 31 mm. Hindwing 30 mm.

Head : labium pale greenish white ; labrum black marked with two large basal transversely oval citron yellow spots ; bases of mandibles yellow ; anteclypeus black ; postclypeus glossy black, narrowly bordered below with citron yellow and with a large spot of the same colour on each side against the eyes ; frons black with a broad citron yellow stripe above which is cut by a median black line into two large oval spots ; vertex black ; occiput yellow encircled with black, the hinder border narrowly black, behind broadly yellow, slightly concave.

Prothorax black broadly marked with citron yellow as follows :—the whole of the posterior lobe, a small geminate spot in front of it, a very large lateral spot nearly confluent with the yellow on the posterior lobe, lastly a broad anterior collar.

Thorax black marked with citron yellow as follows :—a complete mesothoracic collar slightly notched behind at its centre, antehumeral and humeral oblique stripes which converge and become broadly confluent below so as to form a large yellow V-shaped spot on each side of dorsum of thorax. A small spot in the front angle of the alar sinus. Laterally broadly yellow with an incomplete lateral black stripe on the first suture extending up as far as the spiracle and a narrow complete black line on the second suture.

Legs black, the inner sides of anterior pair of femora greenish-yellow ; hind femora with a row of 9 to 10 short robust spines gradually lengthening distad, and numerous smaller spines at the proximal third ; overlapping the base of segment 2 when apposed.

Wings : hyaline ; pterostigma pale yellow between black nervures, rather large, more than one-fourth the length of distance between node and distal end of pterostigma, over 4 to 5 cells ; nodal index $\frac{11\text{–}14}{11\text{–}11}\Big|\frac{13\text{–}11}{12\text{–}11}$; *Cui* and *Cuii* rather divergent in hindwing from a little more than half-way to wing border ; no basal incomplete antenodal nervures.

Abdomen black marked with citron yellow as follows :—segment 1 with a small subdorsal apical black spot, otherwise entirely yellow, 2 with a broad middorsal trilobed stripe and the sides very broadly, 3 with a basal ring confluent with a fine dorsal stripe which extends to apex of segment, and laterally with a very broad stripe nearly interrupted at the jugal suture and not extending to apex of segment, 4 to 7 somewhat similar but the sides broadly black, only segments 4 to 5 having a small oval lateral yellow spot, 8 with a small triangle of yellow on its dorsum at the base, 9 with its apical half bright citron yellow, 10 with its apex narrowly bordered with three triangular spots of yellow.

Anal appendages short, conical, black. Vulvar scale very short and broad, less than one-fourth the length of segment 9, very shallowly notched at apex.

Distribution. Maymyo, N. Shan States, Upper Burma, June 15, 1924, two females collected by Col. F. Wall, I.M.S. This new species is not quite typical of genus *Burmagomphus*, as the pterostigma is too large and the legs too short and the armature of the hind femora differs a little. The large swollen pterostigma recalls that of *Cyclogomphus* but there is no incomplete basal antenodal nervure present in any of the wings of the two specimens. The formation of yellow Vs on the dorsum of thorax, by the fusion of the humeral and antehumeral stripes below, is sufficiently characteristic to distinguish this species from any other Indian species.

Genus : Platygomphus Selys.

Rather large sized Gomphine dragonflies characterized by the anal border of hind wing barely excavated and the anal angle subrounded, colours bright yellow narrowly marked with black. Only two species are known, both from within Indian limits and both very similar in appearance. They are found in the plains, in cultivated areas. Mr. T. B. Fletcher states that at Pusa, they are often seen settled, sunning themselves on the broad green leaves of cannas, in gardens.

Platygomphus martini a species described by myself in the Pusa Memoirs, turns out to be an *Indogomphus*. The type was returned to Pusa and a year later I received other specimens from the Duars, and failing to recognize my own species redescribed it again as *Burmagomphus duarensis* in the Records of the Indian Museum. By the great length and armature of its hind femora and curious proportion of its end abdominal segments, it is clearly an *Indogomphus*.

As Dr. Laidlaw remarks, *Burmagomphus* appears to shade off into *Gomphus* on the one hand and into *Platygomphus* on the other ; this species appears to share characters of both these genera but more especially those of *Indogomphus*. (In Part XX of Indian Dragonflies this Journal, it is to be noted that in the explanation of the plate accompanying that part, '*Indogomphus duarensis*' has been put instead of '*Indogomphus martini*,' although it is correctly designated in the text. I trust that this long chain of errors for which I have been responsible has now come to an end.

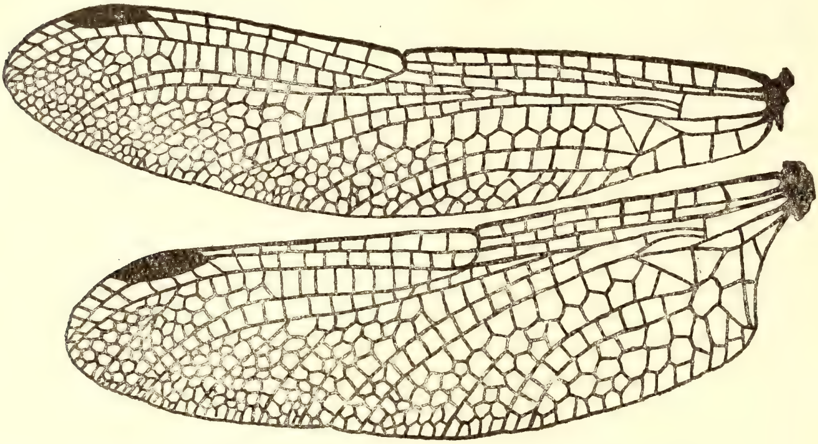


Fig. 2. Wings of *Platygomphus dolabratus* Selys., Male.

Wings: reticulation close, 2 nervures between *Mi-iii* and *Miv* in forewings, only 1 in the hind; pterostigma braced, that of hindwing rather more elongate than the fore, equal in length to about one-fourth the distance between the node and distal end of pterostigma; trigone in forewing with costal and basal sides equal, the distal side slightly longer; in the hind trigone, the distal side considerably longer than the other two and a little sinuous, the basal shorter than costal side; all trigones, hypertrigones and subtrigones entire; discoidal field 2-celled nearly as far as node, then considerably dilated as far as termen; *Miii* and *Miv* distinctly sinuous in the forewing; *Cui* and *Cuii* in both wings parallel to border of wing; *Cuii* not pectinate, 3 rows of cells between it and border of wing; 3 to 4 rows of postanal cells in hindwing, *only 1 in the fore*; first postanal cell entire, extending basad only to middle of subtrigone; only 2 rows of cells between *Mi* and *Mia* at and near origin; only 1 cubital nervure in all wings; arc at the 2nd antenodal nervure; sectors of arc parallel; the 1st and 5th the primary antenodals; no basal incomplete antenodal nervure; anal triangle very narrow, 1-celled; base of wing barely excavate; tornus slightly rounded.

Head rather small, narrow, face sloping, frons rather rounded, occiput flat, straight.

Legs moderately long, hind femora extending to slightly beyond apex of segment 1 and armed with small, closely-set and numerous spines of even size.

Abdomen tumid at base, then thin and cylindrical as far as base of segment 7, then greatly dilated as far as segment 9, but not definitely winged as in *Ictinus*; segments 7 to 10 diminishing gradually in length.

Anal appendages resembling those of genus *Gomphus*, of almost equal length and almost equally divaricate.

Genitalia; lamina depressed, notched; posterior hamules elongate narrow and subcylindrical, projecting perpendicularly from body, apex with a sharply curled spine; lobe very tumid, large and projecting; oreillets moderately large.

Genotype,—*Platygomphus dolabratus* Selys.

Platygomphus dolabratus Selys, Bull. And. Belg. xxi. (2) p. 44, (1854); id. Mon. Gomph., p. 113. (1857); Will. l.c., p. 303 (1901); Laid. l c., pp. 398 and 399 (1922).

Male: Abdomen 41 mm. Hindwing 30 mm.

Head: labium, labrum and face bright yellow, the labum with a small brown median stripe projecting down from base, the postclypeus with a broad transverse black stripe, the upper border of which is slightly convex and encroaches on the anterior surface of frons, the lower produced into two quadrate projections one on each side near the middle line ; frons entirely yellow above and for greater part of front ; vertex black with a large round spot of yellow behind the ocelli ; occiput bright yellow, its border very silghtly convex at the middle. Eyes bottle green.

Prothorax yellow at the sides, black on the dorsum except for a pair of twin spots at the middle of hinder lobe and the whole of the prominent anterior collar.

Thorax yellow marked with black as follows : the dorsum, where the black encloses a complete bright yellow mesothoracic collar and two broad triangular antehumeral spots of duller yellow. Behind these a moderately broad and even, humeral, bright yellow stripe which turns in a little at its upper part. On the sides a short fine vestige of a black line on the first lateral suture and a complete very fine black line on the second suture.

Wings hyaline, a little tinted with yellow occasionally ; pterostigma yellow between black nervures, braced strongly, over 3 cells ; nodal index $\frac{9\text{-}13 \mid 14\text{-}9}{9\text{-}10 \mid 10\text{-}10}$.

Legs yellow marked with black, a narrow distal streak on the outer side of the hind femora and the whole of the outer sides of the other two pairs, all the tibiæ black. Hind femora with a row of short robust spines.

Abdomen yellow marked with black as follows :—segment 1 with a small subdorsal spot and a fine black line running obliquely back and outward from it, segment 2 with a broad subdorsal stripe extending the whole length of segment and enclosing an acorn-shaped spot the stalk of which is directed towards the base of segment, segments 3 to 7 black on dorsum ; in adults this black encloses a lanceolate middorsal spot, broader at base and pointed towards the apical border ; basad the spot is confluent with a basal ring in semi-adult specimens. (In all the specimens from Pusa, the black is present as an apical ring with a subdorsal branch running towards the base of segment on either side, enclosing a prolongation of the ground colour which runs from a basal ring). Segments 8 and 9 are dark brown above changing to yellow on the sides, 8 has a fine middorsal line at the base, segment 10 paler brownish yellow.

Anal appendages yellow or yellowish-brown, bordered with black, as long as segment 10 ; the superiors flat, divaricate, inner sides straight, outer right-angled with prominent outer point, apex pointed as seen from above, slightly bifid as seen in profile. Inferior deeply forked, its branches rather more divaricate than the superiors, their apices turned up a little.

Genitalia : lamina slightly raised, rounded, broadly arched ; posterior hamules very long, projecting almost perpendicularly from abdomen, subcylindrical, the apex strongly curled and ending in a hooked spine ; lobe very bulky, subrounded, deeply cleft, its border somewhat sinuous as seen in profile.

Female : Abdomen 40 mm. Hindwing 33.

Coloured and marked similarly to the male. The end segments of abdomen less dilated, more broadly yellow along the sides, segment 10 yellow. Vulvar scale very short, notched. Occiput low, its free border a little tumid, a little rounded at the middle.

Distribution : Bihar and Bengal. Type in the Selysian collection, paratype females in the British Museum, and paratypes of both sexes in the Pusa and Fraser collections.

Platygomphus feae Selys, *Odonates de Birmanie*, Ann. Mus. Civ. Genov., xxx. (1890) ; Will. l. c., pp. 303 and 304 (1908) ; Laid. l. c. p. 398 (1922).

Male. Abdomen 35–37 mm. Hindwing 30–31 mm.

Head : labium, labrum, face and frons dull yellow, unmarked except for some brownish suffusion of face and a basal black line on frons which extends forwards as far as the crest at the middle ; vertex black ; occiput yellow fringed with greyish hairs, black behind, straight.

Prothorax yellow, black at middle of dorsum.

Thorax yellow marked with black as follows :—the dorsum similar to *dolabratus*, the black enclosing a broad antehumeral oval or subtriangular spot on each side and a moderately narrow humeral yellow stripe. Laterally a single black narrow stripe on the second lateral suture which divides above to form a 'Y', the anterior arm of which runs towards the base of forewing.

Legs black, inner surfaces of femora pale yellow, armed as for genus, short.

Wings hyaline; pterostigma brown between thick black nervures, over 3 cells; nodal index $\frac{6\text{–}13}{10\text{–}9}\Big|\frac{12\text{–}8}{10\text{–}9}$; costal border brownish.

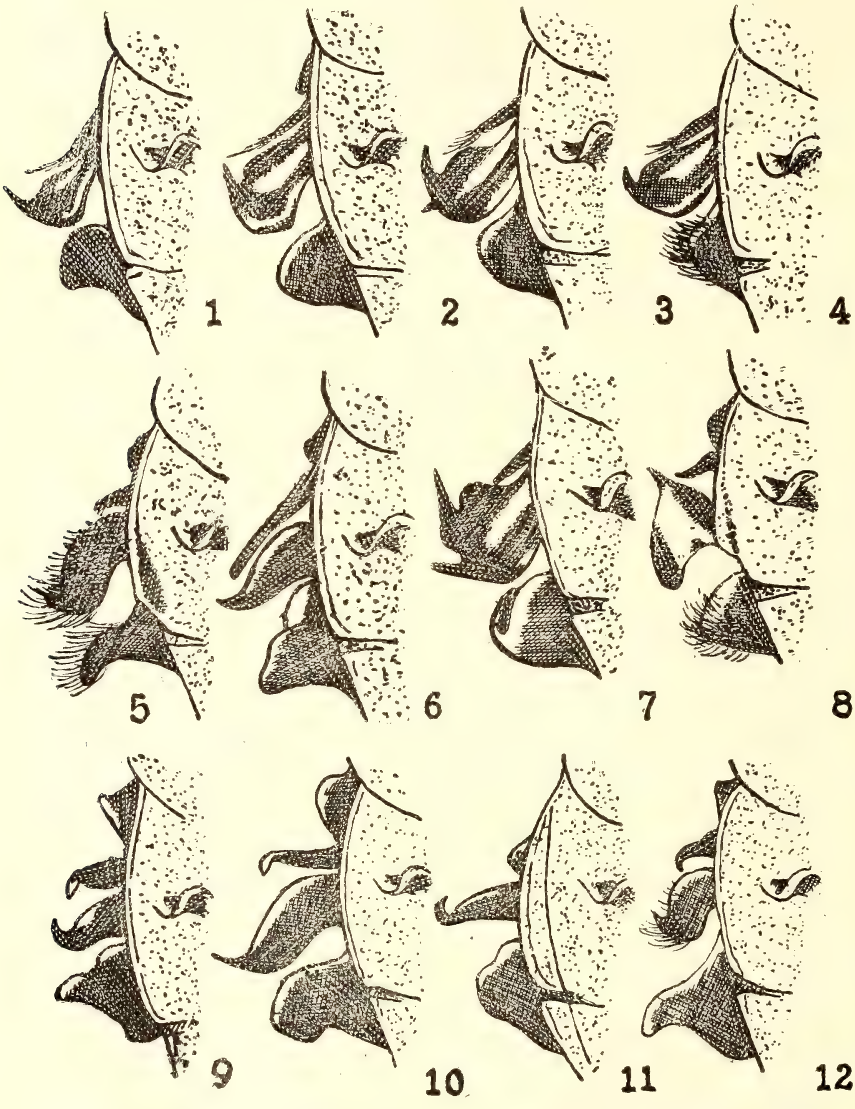


Fig. 3. Genitalia of:—1. *Burmagomphus sivalikensis* Laid, 2. *Burmagomphus hasimaricus* sp. nov. 3. *Burmagomphus cauvericus* sp. nov., 4. *Burmagomphus pyramidalis* Laid, 5. *Anisogomphus occipitalis* (Selys), 6. *Davidioides martini* Fras, 7. *Burmagomphus laidlawi* Fras., 8. *Temnogomphus bivittatus* (Selys), 9. *Indogomphus martini* (Fras.) 10. *Indogomphus longistigma* (Fras.), 11. *Platygomphus dolabratus* Selys, 12. *Anisogomphus caudalis* sp. nov.

Abdomen black marked with yellow as follows :—segment 1 with a middorsal stripe and the sides broadly, 2 with a lanceolate stripe on middorsum extending from base to apex, and the sides very broadly, 3 to 6 with a narrow basal ring prolonged along the sides below, and on 3 and 4 a small median dorsal oval spot, 7 with its basal half yellow, 8 to 10 coloured as in *dolabratus*.

Anal appendages black, equal in length to the 10th abdominal segment. Superiors markedly flattened, the outer border strongly angulate but the point situated much nearer apex than in *dolabratus*. Apex shortly acuminate so that seen in profile it appears to be bifid. Inferior appendage strongly forked, with the apices of its branches blunt and turned slightly up.

Female unknown.

Distribution : Bhamo Burma, in July and August. Type in the Selys collection. Distinguished from *dolabratus* by the face unmarked, the vertex without a spot of yellow, the abdomen more broadly marked with black, the anal appendages and legs black. The forking of the hinder stripe on sides of thorax and segments 5 and 6 without a dorsal spot. Lastly by the shape of the superior anal appendages, which appear more bifid in profile than those of *dolabratus*.

Genus—DAVIDIOIDES Fras.

A monotypic genus closely allied to *Burmagomphus*, colours black marked rather broadly with bright yellow. The single species known is characterized by its close venation, by its elongate trigone of hind wing traversed by a nervure and by its characteristic genitalia. The position of the genus is difficult to locate ; it belongs to *Gomphus*, and its venation, apart from the traversed trigones and its close character, closely resembles that of *Burmagomphus* and *Platygomphus* ; the genitalia is however widely different so that it cannot be placed in either of these two genera. The anal appendages resemble those of genus *Gomphus*, the superiors being yellow and the inferior black.

Wings : reticulation very close ; 2 nervures between *Mi-iii* and *Miv* in forewing, only 1 in the hind ; pterostigma braced, short, less than one-fourth the length of distance between node and distal end of pterostigma ; trigone of forewing entire, with costal and basal sides subequal, the distal rather longer ; trigone of hindwing traversed by a nervure running from the costal to distal side, very elongate, costal and distal side subequal, the basal much shorter ; hypertrigones and subtrigones entire ; discoidal field in forewing 2-celled as far as level of node ; *Miii* and *Miv* distinctly sinuous in the forewings ; *Cui* and *Cuii* parallel in the hindwing, divaricate near the border of wing in the fore ; *Cuii* not pectinate, 3 rows of cells between it and border of wing in forewing ; 1–2 rows of postanal cells in forewing, 4 in the hind, the first cell here entire, extending basad to a little beyond the middle of subtrigone ; two rows of cells between *Mi* and *Mia* at origin ; only 1 cubital nervure in all wings ; arc at or near the second antenodal nervure ; sectors of arc parallel at origin ; the first and sixth the primary antenodals ; no basal incomplete antenodal nervure ; anal triangle 4-celled ; base of hindwing markedly excavate ; tornus very acute.

Head moderately large, face oblique, frons slightly rounded, occiput a little concave.

Legs moderately long, hind femora extending on to segment 2 and armed with short, closely-set, evenly-sized spines.

Abdomen tumid at base, thin, long and cylindrical as far as segment 8 which with 9 is rather dilated laterally, 10 very small.

Anal appendages resembling those of genus *Gomphus*, of about equal length and almost equally divaricate, superiors yellow, inferior black.

Genitalia : lamina slightly raised ; anterior hamules very long, thin and flattened, nearly as long as the posterior hamules, which are very robust, broad at base, sinuous, tapering to a fine point, projecting markedly ; lobe bulbous with a markedly prominent, trowel-like lip.

Distribution. Western Ghats of India. Habits similar to those of *Burmagomphus* but found at lower levels.

Davidioides martini Fras., l. c., pp. 472 and 473 (1924).

Male: Abdomen 38 mm. Hindwing 33 mm.

Head : labium dirty yellow ; labrum black with a large basal spot on each side, widely separated, yellow ; bases of mandibles yellow ; anteclypeus yellow, postclypeus black; frons black on lower part of front, yellow on upper part and above, its base above broadly black especially at the middle; vertex and occiput black, the latter simple, slightly concave.

Prothorax black marked with yellow as follows:—a minute spot on centre of posterior lobe, a large lateral spot on each side of middle lobe, a twin spot on the middorsum and an anterior collar.

Thorax black on dorsum, yellow on the sides, a slightly interrupted yellow mesothoracic collar, slightly oblique antehumeral stripes separated widely from the collar below and not quite reaching the alar sinus above, a minute upper humeral spot. Laterally two narrow parallel black stripes on the sutures enclosing an equally narrow yellow line, lastly a narrow black posterior border to the metepimeron confluent above and below with the posterior black stripe. Yellow beneath.

Legs black, anterior and middle pairs of femora yellow within, armed with a row of very closely-set, short, even spines.

Wings hyaline; pterostigma blackish brown, braced, over 3 to 4 cells; nodal index $\frac{12\text{–}14 \mid 16\text{–}12}{12\text{–}10 \mid 10\text{–}13}$.

Abdomen black marked with yellow as follows:—segment 1 with a large spot on dorsum and the sides broadly, 2 with a middorsal fusiform spot not extending to base or apex, the ventral and lower part of apical borders narrowly, 3 to 7 with basal rings, narrow on 3 to 6, occupying the basal half 7, where also there is a small apico-lateral spot on each side, 8 to 10 unmarked.

Anal appendages. Superiors as long as segment 10, bright yellow, narrowly black at base, widely divaricate, conical, tapering to a point, with 5 or 6 minute black spines on the ventral surface. Inferior deeply cleft, its branches widely divaricate and equally so as superiors but shorter, curled slightly up at apex, black.

Genitalia described under generic characters.

Distribution. Western Ghats of India. Type in the Fraser collection from Kunnoth, N. Malabar, May 18, 1923.

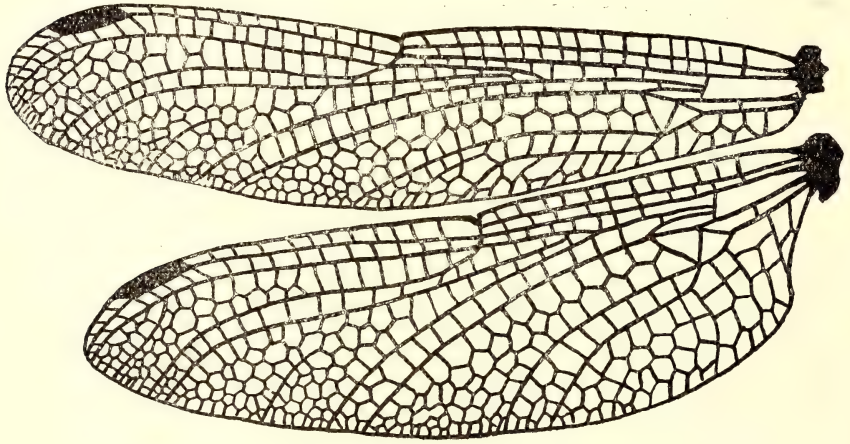


Fig. 4—Wings of *Anisogomphus occipitalis* (Selys.) Male

Genus—ANISOGOMPHUS Selys

A genus of moderately large Gomphine dragonflies coloured black vividly marked with greenish or citron yellow. The genus was founded by Selys to include two species,—*occipitalis* and *bivittatus*. The latter species has been removed to a new genus by Dr. Laidlaw on venational grounds. An examination of its genitalia, which differs from all other known species of the family, shows that this was fully justified. A second species,—*orites* has been described by the same author and a third new species is described below,—*caudalis*. All three species are found in North-East India at the foot of the

Himalayas, in montane and submontane tracts, frequenting and breeding in mountain streams. But little is known of their habits but these seem to be similar to those of *Burmagomphus.*

Wings: reticulation close; pterostigma braced, a little swollen, short, less than one-fourth the distance between node and distal end of pterostigma, of nearly equal size in the two wings; 3 to 4 nervures between *Mi-iii* and *Miv* in the forewing, 1 or 2 in the hind; all trigones, hypertrigones and subtrigones entire; trigone in forewing with costal side slightly shorter than proximal, and the proximal considerably shorter than the distal; in the hind the costal considerably shorter than the basal and but little shorter than the distal side; discoidal field in forewing 2-celled to level of node; *Miii* and *Miv* slightly sinuous in forewing; *Cui* and *Cuii* in both wings parallel to nearly as far as wing border; *Cuii* in forewing pectinate, 2 rows of cells between it and border of wing; 2 rows of postanal cells in forewing, 4 in the hind, where the first cell is entire, or divided, and extends proximad nearly as far as proximal end of subtrigone; 2 rows of cells between *Mi* and *Mia*; 1 or 2 cubital nervures in forewing, 1 in the hind; arc at or a little distad of the 2nd antenodal nervure; sectors of arc parallel for a very short distance from origin, then divaricate; the 1st and 7th the primary antenodals; no basal incomplete antenodal nervure; anal triangle 3-celled; base of wing markedly excavate; tornus nearly right-angled.

Head: face oblique, frons slightly rounded but prominent, occiput flat, simple.

Legs moderately long, hind femora extending to apex of segment 1, armed with 4 to 6 robust long spines, the longest of which are near the middle of limb; at the base numerous short spines.

Abdomen tumid at base, thin and cylindrical to as far as segment 7; 8 to 10 slightly dilated, the end of abdomen somewhat squared; segments gradually decreasing in length from 7 to 10.

Anal appendages. Superiors short, pale coloured, directed straight back, parallel, armed beneath with a basal robust spinal process. Inferior black, deeply cleft into two widely divaricate branches which project laterally from beneath the superiors.

Genitalia: lamina slightly raised, arched; anterior hamules small, stillette-shaped; posterior hamules very robust, bulky, sinuous, S-shaped, ending in a very short spine, surface minutely spined; lobe tongue-shaped, curling back, tapering, coated with long hairs; oreillets moderately large.

Genotype—*Anisogomphus occipitalis* Selys.

Anisogomphus occipitalis Selys.

Male: Abdomen 52 mm. Hindwing 30 mm.

Head. Labium yellow, midlobe blackish brown; labrum glossy black with two small, basal, greenish-yellow spots; bases of mandibles citron yellow, rest of face glossy black; frons broadly greenish-yellow; vertex and occiput black; eyes bottle green.

Prothorax black with a large lateral spot and a median twin, smaller spot on midlobe, citron yellow.

Thorax black marked with citron yellow or greenish-yellow as follows:—a slightly interrupted mesothoracic collar, slightly oblique antehumeral stripes which are confluent below with the middle of each half of the mesothoracic collar, an upper triangular spot and the vestiges of a humeral stripe well below this.

Laterally two narrow stripes of black on the sutures, the first of which curls forward above and sends a short prolongation back below at the level of the thoracic spiracle, the stripe on the second suture sends a short prolongation forwards and downwards below the level of spiracle.

Wings usually hyaline or more or less enfumed brown according to the age of specimens; pterostigma dark reddish brown, over 3 to 4 cells, lying between thick black nervures; 2 cubital nervures in the forewing, only 1 in the hind; membrane almost obsolete, greyish; nodal index $\dfrac{10\text{–}15\,|\,16\text{–}12}{12\text{–}12\,|\,12\text{–}10}$, $\dfrac{12\text{–}18\,|\,16\text{–}13}{12\text{–}11\,|\,13\text{–}11}$.

Legs black, inner sides of anterior femora yellow, armed as for genus.

Abdomen black marked with yellow as follows:—segment 1 with a large triangular dorsal spot tapering basad, and its sides very broadly, 2 with a trilobed middorsal stripe extending the whole length of segment, the middle lobe of the stripe globular, and on the sides, the oreillets and a very large apical spot which is prolonged along the ventral border towards the base of segment, 3 with a baso-lateral triangular spot and its dorsal carina finely but more broadly at the base, 4 to 6 finely yellow along the middorsal carina, 7 similar but more broadly so. 8 with a mere basal vestige of this stripe, 9 and 10 unmarked. The 10th segment globular, compressed dorsally at the apex.

Anal appendages. Superiors closely apposed at the base, slightly divaricate thereafter, equal to about half the length of segment 10, pale greenish white at base, reddish thereafter, conical, pointed. Seen from the side, a stout, long, blackish brown process with blunt nose is seen springing from beneath near the base of each appendage and closely apposed to each other. The whole appendage bears a striking resemblance to a fox's head, the superior parts being the ears, the apposed lower parts the face muzzle. Inferior appendage black, deeply cleft into two widely divaricate branches. So widely divaricate are these, that their inner borders are almost in a straight line. Each branch very robust, bluntly pointed and projecting widely from beneath the superiors.

Genitalia : lamina depressed, broadly, arched ; anterior hamules short broad at base, tapering to a fine point which is curled back ; posterior hamules very robust, thick, sinuously curved, S-shaped, apex shortly pointed and directed slightly forwards, the surface coated with minute spines and hairs, the latter especially thick near the apex ; lobe-shaped like the spout of a jug, long and tapering, coated with long hairs.

Female : Abdomen 33 mm. Hindwing 32 mm.

Very similar to the male, differs as follows :—labium very occasionally unmarked (this character sometime shared by the male) ; thoracic stripe more evident (sometimes confluent with the upper spot, especially in tenerals of both sexes) ; abdominal markings more extensive, thus the dorsal stripe on segment 2 is broader and the lateral yellow on the same segment is uninterrupted, segment 3 has a broad lateral stripe extending the whole length of segment, and tapering towards the apex, segments 4 to 7 have similar stripes but not reaching the apical border of segments and broadly interrupted at the level of the transverse suture, segment 8 has a vestige of this stripe only. The femoral spines are more numerous, more robust and more widely-spaced (6 to 7 in number) ; nodal index $\frac{14\text{–}19}{13\text{–}14}\Big|\frac{19\text{–}14}{13\text{–}13}$; the 1st and 8th are the primary antenodals ; occiput more deeply notched than in the male. Vulvar scale of great length, as long nearly as segment 9, very narrow, tapering to a blunt point, split nearly to its base into two closely apposed scales, which closely resemble those of *Onychogomphus M-flavum.*

Distribution : Northern Bengal and Assam, from June to August. Type in the Selysian collection. Paratypes in the British Museum, Pusa and Indian Museums, and in the Laidlaw and Fraser collections. The shape of the anal appendages of the male, the shape of the vulvar scale of the female, and the presence of 2 cubital nervures in the forewing will distinguish this species from the others.

Anisogomphus orites Laid., l. c., pp. 393 and 394 (1922).

Male : Abdomen 31 mm. Hindwing 30 mm.

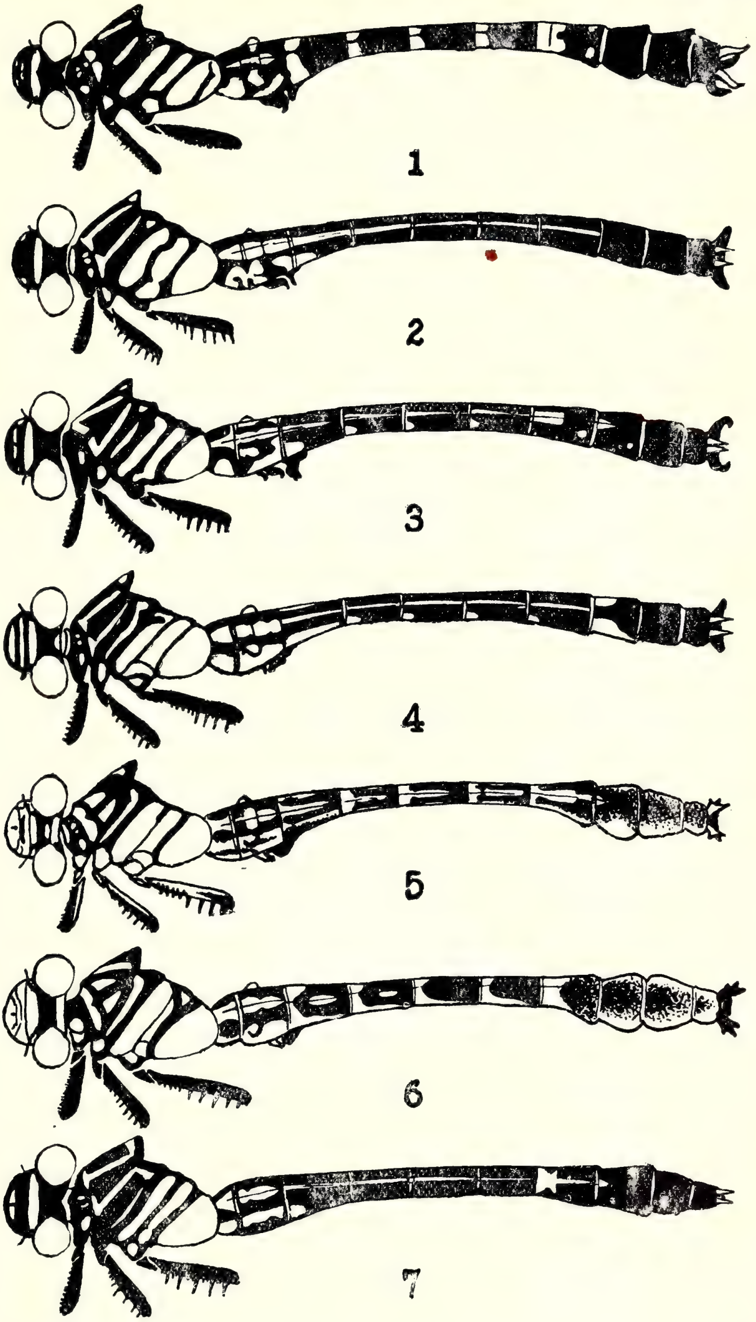
Head : labium with midlobe black, the lateral citron yellow ; labrum black marked with two small transversely oval basal greenish-yellow spots ; bases of mandibles broadly citron yellow ; rest of head black save frons which is broadly citron yellow.

Prothorax black marked with citron yellow as follows :—an anterior collar, a large spot on each side, a median spot on the posterior lobe and a small geminate spot just in front of it.

Thorax black marked with bright citron yellow as follows :—a broadly interrupted mesothoracic collar, oblique antehumeral narrow stripes confluent below with the outer part of the collar, a small triangular upper humeral spot, its long axis across the dorsum of thorax and its apex confluent or almost confluent with upper part of the antehumeral stripe, a vestigial fine humeral line situated well below the humeral spot. Laterally two narrow black stripes on the lateral sutures, the hinder of which is continued back for some distance along the ventral border.

Legs black, the first pair of femora yellow internally.

PLATE II



Lateral views of :—1. *Davidioides martini* Fras. ♂ 2. *Anisogomphus occipitalis* Selys ♂ 3. *Anisogomphus caudalis* sp. nov. ♂ 4. *Temnogomphus bivittatus* (Selys.) ♂ 5. *Platygomphus dolabratus* Selys ♂ 6. *Platygomphui feae* Selys ♂ 7. *Anisogomphus orites* Laid. ♀

Wings hyaline, sometimes palely enfumed in adults ; pterostigma dark brown between thick black nervures, over 5 to 6 cells ; nodal index $\frac{14\text{–}20 \mid 17\text{–}13}{13\text{–}13 \mid 12\text{–}12}$, trigones, entire, but in one specimen, those of the hindwings are traversed by a nervure which runs from the basal to the outer side ; *only one cubital nervure in all wings*.

Abdomen black marked with citron yellow as follows :—segment 1 with a middorsal spot and the sides broadly, 2 with a trilobed middorsal stripe extending the whole length of segment, 3 to 7 with the middorsal carina finely yellow, more conspicuous on the latter segment. Segment 2 laterally, including the oreillets, and a basolateral spot on segment 3. Segments 8 to 10 unmarked.

Anal appendages. Superiors short, greenish white, conical, pointed, each bearing a ventro-basal process somewhat like that seen in *occipitalis* but narrow at base broadening triangularly below and ending in a point behind. Inferior black, cleft into two very widely divaricate branches resembling those of *occipitalis*, but curled up a little at apices.

Genitalia unknown, not described by the author.

Female : Abdomen 34 mm. Hindwing 32 mm.

Very similar to the male. The antehumeral stripe nearly always confluent with the humeral spot, sometimes broadly so. Segment 2 more broadly yellow laterally and segments 3 to 5 with lateral stripes as in *occipitalis*, segments 6 and 7 with only a basal spot left of this stripe, and 7 with a rather large basal dorsal spot formed by an expansion of the middorsal carinal stripe. Anal appendages small, greenish yellow. Vulvar scale very different to that of *occipitalis*, very short and broad, especially at the base, its apex about half the breadth of base and very shallowly concave, not split. Hind femora with a row of 6 long, robust, widely-spaced spines, this limb extending to middle of the 2nd segment.

Distribution. Northern Bengal, Assam and Sikkim. Distinguished from *occipitalis* by having only a single cubital nervure to all wings in both sexes. The female is at once distinguished by its short broad vulvar scale contrasting strongly with the long, narrow cleft scale of *occipitalis*. For the rest, the distinctive dorsal thoracic markings will separate it from the other two species. I have had no opportunity of examining the genitalia of the male.

The type comes from Shillong, Assam, 6,000 ft. and was taken by Mr. T. Bainbrigge Fletcher and is now in the Indian Museum. Paratype females, including the one with traversed trigones in my own collection. This feature is so regular in the two opposite wings that it can hardly be regarded as an abnormality ; more material will be necessary to settle this point. Frequents and breeds in mountain streams, its habits apparently similar to those of *Burmagomphus*. The female taken by Mr. Fletcher was captured flying along a hedge some distance from any stream.

Anisogomphus caudalis sp. nov.

Male : Abdomen 36 mm. Hindwing 30 mm.

Head : labium with lateral lobes greenish-white, midlobe black ; labrum black with narrow linear basal streak greenish-white, nearly divided at its middle ; bases of mandibles pale greenish-white ; ante- and post-clypeus glossy black with a small greeny-white spot at the sides of latter against the eyes ; frons black in front, broadly greenish-yellow above ; vertex and occiput black the latter nearly straight.

Prothorax black marked with a large transversely oval spot of yellow on each side.

Thorax black marked with greenish-yellow as follows :—a broadly interrupted mesothoracic collar, narrow, nearly parallel antehumeral stripes forming inverted 7s. by confluence with the outer ends of the mesothoracic collar below, an upper triangular spot and a lower vestigial stripe representing a broken humeral stripe.

Laterally two narrow black stripes on the sutures, the hinder of which fuses with an elongate triangular spot beneath thorax. The ground colour at the sides greenish-yellow.

Legs black, unmarked, hind femora with a field of tiny spines on the ventral surface of the proximal three-fifths and an inner and outer row of 5 robust spines on the distal two-fifths.

Wing hyaline; pterostigma black, short; 2 to 3 cubital nervures in forewing, only 1 in the hind; 4 to 5 rows of postanal cells in hindwing, the first entire; nodal index $\frac{12\text{–}17|16\text{–}12}{13\text{–}13|12\text{–}13}$.

Abdomen black marked with citron yellow as follows:—segment 1 with a dorsal triangular spot tapering basad, and its sides very broadly, 2 with a trilobed middorsal stripe extending the whole length of segment, the oreillets and the lower part of its apical border and apical two-thirds of its ventral border broadly, 3 with its middorsal carina finely and a large baso-lateral triangular spot, 4 to 6 similar but the lateral spots very small, 7 with the basal half of dorsum narrowly, the end of this spot square, segment 8 with a small triangular spot on its dorsum at the base. Lastly 7 and 8 each with a small round apico-lateral spot, rather larger on segment 7; 9 and 10 unmarked.

Anal appendages: Superiors short, about half the length of segment 10, greenish-yellow above on dorsum, black below and at sides, tapering to a fine point and closely apposed as seen from above, broadly triangular as seen from the side, this due to the fusion of a broad triangular plate into the underside of the appendage, beginning as a short spine near the underside of apex and sloping back towards the abdomen. This plate is not free as in the process seen in the other two species. Inferior appendage deeply cleft into two widely divaricate branches, the apices of which are markedly curled upward and rather sharply pointed.

Genitalia: lobe hood-shaped, rather depressed; anterior hamules exactly similar to those of *occipitalis*; posterior also shaped similarly but much smaller and not spined on surface; lobe similar to that of *occipitalis*.

Distribution: Assam. Type from Shillong, 6,000 feet, taken by Mr. T. Bainbrigge Fletcher, June 18, 1924, now in the British Museum collection. This species closely resembles *orites* but differs in the following points:—Lateral spots on postclypeus; humeral spots further removed from the upper ends of antehumeral stripes; lateral spots on segments 4 to 6, the basal half of 7 yellow on dorsum, apico-lateral spots on segments 7 and 8; lastly the formation of the superior anal appendages. It agrees by the extra cubital nervures in the forewings and the thoracic markings are very similar. The nodal index is almost the same, especially that of the hindwings. The abdominal markings appear to be the best guide for separating the two species.

Genus—TEMNOGOMPHUS Laid.

Anisogomphus Selys *pars*. Mon. Gomph., p. 120, (1857); Laid, l.c., p. 394 (1922).

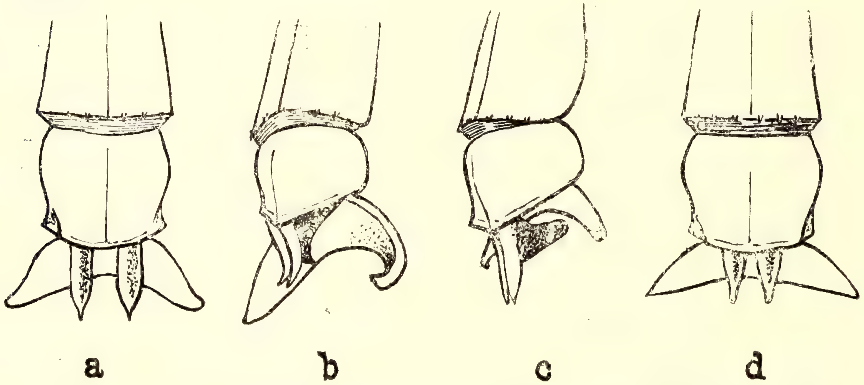


FIG. 5.—(*a*) Anal appendages of *Temnogomphus bivittatus* (Selys), male, seen from above. (*b*) The same of *Anisogomphus caudalis*, sp. nov., male, seen from above and slightly from one side. (*c*) The same of *Anisogomphus occipitalis* Selys, male, seen from the side. (*d*) The same seen from above.

A monotypic genus, containing a single rather large Gomphine dragonfly coloured black vividly marked with bright yellow. In general facies and size, closely resembling species of *Anisogomphus*, but distinguished by the presence of an incomplete antenodal nervure in all wings and by very different genitalia. Habits and distribution similar to that genus.

Wings : reticulation close ; 2 to 3 nervures between *Mi-iii* and *Miv* in the forewing, only 1 in the hind ; pterostigma braced, a little swollen, short, less than one-fourth the length of distance between node and distal end of pterostigma, equal in size in both wings ; all trigones, hypertrigones and subtrigones entire ; trigone in forewings with costal and proximal sides approximately equal, the distal considerably longer ; trigone in hindwing with costal side considerably longer than proximal and only slightly shorter than the distal ; discoidal field 2–celled, nearly to level of node, divaricate thereafter ; *Miii* and *Miv* markedly sinuous in forewings ; *Cui* and *Cuii* parallel in both wings nearly as far as border of wings ; *Cuii* not pectinate in forewing, 2 to 3 rows of cells between it and border of wing ; 2 rows of postanal cells in forewing, 4 in the hind ; the first postanal cell in hindwing entire, extending nearly to proximal end of subtrigone ; only a single row of cells between *Mi* and *Mia* ; only 1 cubital nervure in all wings ; arc between the 1st and 2nd antenodal nervures ; sectors of arc divergent shortly after origin ; the 1st and 6th or 7th the primary antenodals ; *a basal incomplete antenodal nervure present in all wings* ; anal triangle 3-celled ; base of hindwing oblique ; tornus angulate, but slightly obtuse.

Head moderately large ; face slightly oblique, frons prominent, occiput slightly concave.

Legs long, hind femora extending as far as the oreillets on 2nd segment, armed with 4 or 5 long, robust spines, the longest near the middle of the limb, a field of minute spines on the proximal half.

Abdomen tumid at base, thin and cylindrical as far as middle of segment 7, dilated thereafter as far as middle of segment 9, the segments diminishing gradually in length from 7 to 10, latter very small.

Anal appendages black or dark brown, superiors short, parallel, directed straight back. Inferior deeply cleft into widely divaricate branches.

Genitalia : lamina slightly raised, arched ; anterior hamules short, triangular, tapering to a long fine point ; posterior hamules enormously enlarged, pale coloured, with a broad rounded lobe projecting back and a very large robust spine projecting forward ; lobe tumid, rounded, prominent.

Genotype.—*Temnogomphus bivittatus* (Selys.).

Temnogomphus bivittatus (Selys) (*Gomphus bivittatus*), Bull. Acad. Belg., xxx. (2), p. 46 (1854) ; id. Mon. Gomph. p. 168 (1857) ; Will. l.c., p. 298 (1908) ; Laid. l.c., pp. 394 and 395 (*Temnogomphus bivittatus*) (1922).

Male : Abdomen 36 mm. Hindwing 33 mm.

Head : labium greenish-yellow, border of middle lobe black ; labrum greenish-yellow as also bases of mandibles ; anteclypeus glossy black ; postclypeus greenish-yellow bordered with black above ; frons greenish-yellow, its lower part in front black, this black confluent with the black of upper border of postclypeus. The face is thus crossed by a succession of alternating greenish-yellow and black stripes. Vertex black ; occiput markedly convex, yellow fringed with black hairs.

Prothorax black marked with a moderately large subdorsal spot on each side of the posterior lobe and a large geminate spot at its middle above.

Thorax black marked with bright greenish-yellow as follows :—An interrupted mesothoracic collar confluent with very oblique antehumeral stripes on each side which form with it inverted figures 7, long sinuous humeral stripes slightly expanded at the upper end and continuous with the yellow at base of middle pair of legs below. Laterally bright greeenish-yellow marked with two fine sinuous black lines on the lateral sutures. The yellow space between the humeral black and the line on the first suture, sends a hook-like extension above into the humeral black, this curious marking being invariably present. The wavy black stripes on the yellow ground colour of the sides give a curiously tigrine effect to this insect.

Legs black, the hind femora with a linear yellow stripe running the whole length of the outer side, the middle femora with a distal stripe at the inner sides, and the anterior femora entirely yellow on the inner sides. Hind femora armed as for genus.

Wings hyaline, costa greenish yellow in subadults; pterostigma light brown between black nervures, over 3 to 4 cells; nodal index :— $\dfrac{9\text{–}16 \mid 14\text{–}10}{8\text{–}10 \mid 9\text{–}8}$ $\dfrac{11\text{–}16 \mid 15\text{–}11}{9\text{–}11 \mid 11\text{–}9}$.

Abdomen black marked with citron yellow as follows :—a middorsal stripe running from segment 1 to 7, broad and triangular on 1, broad and trilobed on segment 2, narrow and fine from thence to the end of 7, and interrupted only narrowly at the apical border of each segment. The sides of segments 1 and 2 broadly, including the oreillets. Segment 3 with a broad lateral stripe tapering apicad, and interrupted slightly at the jugal suture, 4 to 7 with a small triangular baso-lateral spot, and 7 with an additional midventrolateral spot, segment 8 with a very large baso-lateral spot which runs narrowly along the ventral border nearly to apical border and ascends some way up the dorsum, segments 9 and 10 unmarked. (In one male that I have examined, there is a much larger spot on the side of segment 8, extending as far as apex of segment, and a similar spot on the side of 9, segment 10 has a much smaller lateral spot. In all other respects it resembles the type.)

Anal appendages: Superiors black at base, dark reddish brown as far as apex, conical, subcylindrical, with a small ventral spine beneath at about their middles, directed straight back, parallel, a little separated. Inferior black or very dark brown, deeply cleft into two widely divaricate branches which project back and outward from beneath the superiors, apices pointed and a little curled up at extreme apex.

Genitalia as for genus, described above. The posterior hamules are of unique shape, black, or bright yellow in some, cylindrical at base, and broadened at end so as to be roughly T-shaped, the hinder limb long and rounded at end, the anterior end bearing a sharp robust spine tipped with black. The whole process is shaped like a horse's head, the hinder part the muzzle, the spine representing its ears.

Female: Abdomen 38 mm. Hindwing 33 mm.

Coloured and marked exactly the same as male, except that there is a continuation of the lateral stripe on segments 4, 5 and 6, and that 8 and 9 are marked as described above for an aberrant male. Segment 10 is broadly yellow laterally and the anal appendages are also reddish yellow, very short and conical.

The vulvar scale highly specialized. There is first an elliptical ridge at the ventro-apical border of segment 8, followed by a flatter ridge, from the border of which springs the vulvar scale proper, this is narrow, about half the length of segment 9, very slightly bifid at its apex which is squared and nearly as broad as its base, the surface is raised on either side into two long ridges which taper to a point which projects slightly beyond the apex of scale. These two ridges appear to be the usual bilateral scales united by a chitinous web across the mid line.

The femora are armed with longer, more widely-spaced and more numerous spines (about 8 or 9 long ones, and some shorter near the base). Nodal index $\dfrac{13\text{–}17 \mid 15\text{–}10}{12\text{–}10 \mid 11\text{–}11}$; pterostigma longer, over 4 to 5 cells; 5 rows of postanal cells in hindwing.

Distribution: Northern Bengal and Sikkim. Darjeeling, May 26, 1924 (at Pashok, August 31, 1920 (at Mangpu, 2,400 ft.) Assam, Kumaon, May 1911.

I have no information as to the habits of this insect. It may be at once recognized by the alternating three black stripes and three bright yellow ones on the face, by the dilated terminal segments of abdomen combined with the character of anal appendages resembling those of an—*Anisogomphus*, as seen from above, and lastly by the incomplete antenodal nervure in all wings, which is never found in *Anisogomphus*.

(*To be continued.*)

THE IDENTIFICATION OF INDIAN BUTTERFLIES

BY

COL. W. H. EVANS, D.S.O., F.Z.S., F.E.S.

(Continued from page 83 of this Volume.)

Part X

(With a plate)

I. Hesperiidæ.—*(contd.)*

I. 47. Carterocephalus. The Mountain Hoppers. (Plate 31.) Above with prominent white or yellow spots on both wings (or yellow with black spots). Unh prominent yellow or silver markings.

1a (4a). Unh with yellow spots ; no spot in 8. Upf and Uph black with large yellow spots or yellow with black spots. Cilia ochreous.

Palæmon Group.

1b (3). Uph always with a yellow submarginal spot in 6 in addition the large yellow spots in and end cell and discal in 2 and 1.

1 (2). Upf veins black on the yellow area. Upf dark brown with large yellow spots, 2 in cell, base 2, discal in 1-4, small detached spots 4 and 5, conjoined apical in 6-8, complete marginal series. Unf mostly yellow, black veins at margin. Unh ochreous, spots black edged, veins black at margin ; additional large spot in 7.

palæmon, Pallas (30). The European Hopper. Europe to Amur and N. America. (= *paniscus*, F. ; *brontes*, Schiff).

2 (1). Upf and margins below veins not black (slightly so in some races of *silvius*).

α. ♂ upf yellow with black spots, mid cell, end cell, near base 2 and a dash mid 1 also a submarginal row. Unh as *palæmon*, but ground colour is brown ; uph all spots show but except for the dorsum the wing is overlaid yellow, obscuring all but the submarginal spots and spots in 1 and 7. ♀ dark brown with spots as *palæmon*, but larger : discal series forms a continuous band confluent with the spots in 4 and 5 and the apical spots ; submarginal spots small. Uph with a spot in 8.

silvius silvius, Knoch, (30). The Northern Hopper. N. Europe to Amur.

β. ♂ upf much redder ochreous, black spots larger, inner edge spot end cell continued to costa ; submarginal spots much enlarged (except 4 and 5) and reach termen. Uph spots less rounded. ♀ as *silvius*, but spots reduced, discal spots not joined to the spots in 4 and 5 ; submarginal spots F absent, on H absent or incomplete. Unh ♂♀ appearing very different, yellow spots square and conjoined, wing appearing entirely yellow with small brown spots.

silvius houangty, Ob. W. China.

γ. ♂ upf reddish ochreous, black spots very large ; spot mid cell conjoined to inner edge of spot in 2, which reaches dorsum ; submarginal spots large, conjoined and merged to the dark termen, except for a single spot at the apex ; dorsum narrowly dark. Uph dark brown with yellow spots as in the ♀, but with traces of submarginal spots and a spot in 7. ♀ upf spots still more reduced, sub-basal yellow band mid cell to v1, discal band v1–v4 meeting outer edge of large spot before end cell, small detached streaks in 4 and 5, apical conjoined spots 6–8 ; uph no submarginal spots or spot in 7, only discal in 1 and 2, large discal spots in cell, 2, 4–5 and submarginal spot in 6. Unh overlaid greenish ochreous with usual black spotting.

3 (1b). *silvius shoaka*, Evans. S. E. Thibet. Bhutan at 10,000 feet. R. Uph no yellow submarginal spot in 6 ; 3 large spots, mid cell, 2 and 4–5, small

I. 47. Carterocephalus.—(*contd.*)

spot in 1. Upf orange costal streak from base, large spot from base 2 to v1, discal in 1–3, before end cell to costa, in 4–5 near margin, apical in 6–8. Unh shining greenish ashy, spots as above and a spot mid 7.

abax, Ob. (30). The Yellow Thibet Hopper. W. China and E. Thibet.

4a (1a). Unh spots silver. Cilia ashy grey or white.

Argyrostigma Group.

4 (5a). Unh ochreous, outwardly with ferruginous patches, no pale spot in 7; silver streak from near base cell to near termen in 5, large spot mid 1, small spot in 2, submarginal band 1–5 and large submarginal spot in 6. Above dark brown with pale yellow spots arranged as in *Taractrocera maevius;* spot at base 2 to v1, discal row 1–5, apical 6–8, spot before end cell and streak on costa above it. Uph discal spots in 2 and 4–5, submarginal row 1–4 and large submarginal spot in 6.

pulchra, Leech (25). The Beautiful Mountain Hopper. W. China and N. E. Thibet. (= *ops*, Groum).

5a (4). Unh always a silver spot mid 7, continued by a pale or silver spot to costa (in *avanti* spot is small and costa pale).

5 (6a). Upf dark brown with large yellow spots, yellow areas = dark areas; spot near base cell continued to base 2 and v1, spot before mid cell continued to costa; discal band 1–3, subapical band 4–8, streak at apex. Unh ferruginous.

α. Upf with basal costal yellow streak discal band not joined to apical or cell spots. Uph yellow spot mid cell, discal band 1–6, large submarginal spots in 3 and 6, small in 2, 5 and 7. Unh silver spots arranged as the yellow spots above, but an additional large spot mid 7, continued to costa by a yellow spot.

argyrostigma argyrostigma, Evers. (25–30). The Orange and Silver Hopper. Amur, Altai, Mongolia; Tatung Mts. and Amdo, E. Thibet.

β. Upf spots yellow white; a spot base costa, discal band of 4 conjoined spots, double apical spot. Uph large central yellow spot and two beyond. Unh as last.

argyrostigma montana, South. Litang, 14,000 feet.

γ. Upf spots orange and very large; as *argyrostigma*, but no costal streak, discal band conjoined to subapical and to spot near end cell. Uph single very large orange spot and a submarginal dash in 5. Unh silver spots as the yellow ones above, but no submarginal spots and with a small spot mid 7 and cell.

argyrostigma avanti, DeN. Chumbi Valley and Kumaon, 12,000 ft. VR.

6a (5). Above pale spots small, dark areas predominate. Uph at most 2 discal spots, no submarginal spots. Spots usually white.

6 (7a). Upf white spot in 2 far from spot in cell, midway between it and termen; usually 2 small spots in 1, under spot in 2 and a small spot in 3; conjoined spots 4–5 and 6–8; apex white. Unf white bar end cell, marginal spots at apex in 6 and 7. Unh dark ferruginous; silver spot mid cell, silver central band 1–8 and submarginal band 2–7 (spots in 3 and 6 enlarged), may be discontinuous. α. Unh inner edge discal band regular.

* *dieckmanni dieckmanni*, Graeser. (25–30). The Silver Mountain Hopper. W. China, E. Thibet. Upper Burma (Fort White). VR. (= *gemmata*, Leech and *demea*, Ob).

β. Unh inner edge discal band irregular.

dieckmanni dulcis Ob. Amdo and Kokonor.

7a (6). Upf spots in 2 and 1 immediately under and in line with spot end cell. Unh submarginal band discontinuous, at most dots in 4 and 5, usually preceded by a pale streak; inner edge of discal band irregular.

7 (8a). Above spots yellow. Uph spot end cell and in 2 separate, latter shifted in. Unh overlaid sparse yellow scales and the spot mid costa in 8 is yellow. (♀ figured by Elwes as ♂ *niveomaculata*) spots upf large.

flavomaculatus, Ob. (30–35). The Silver and Yellow Hopper. W. China, E. Thibet, Kokonor. (= *postnigra*, South from Batang).

8a (7). Above markings white and unh the pale spot mid costa is silvery.

8 (9). Unh discal band posteriorly macular, spots in 2 and 3 rounded and detached, placed behind spots in 4 and 5.

α. Upf no basal markings, spots end cell and in 2 very large, much larger than the apical spots.

I. 47. Carterocephalus.—(*contd.*)

niveomaculatus niveomaculatus, Ob. (30). The Snow Mountain Hopper. W. China and E. Thibet.

β. Upf spots base cell and costa present though faint; discal markings narrow, no wider than the apical spots.

niveomaculatus thibetanus, South. S. E. Thibet.

9 (8). Unh discal band continuous and in a straight line.

α. Upf discal spots large, prominent spot base costa and cell, dot in 3. Unh discal band broad.

christophi christophi, Groum. (30). Christoph's Mountain Hopper. Thibet Sinin Mts., Amdo and Kokonor.

β. Above markings very narrow. Unh discal band nearly linear.

christophi micio, Ob. Tsekou, E. Thibet.

(I have been unable to place the following—*demeaplutus* and *flavostigma*, Ob.)

I. 52. Elwesia. Leslie's Hopper.

Above dull dark brown; cilia whitish. Upf non-hyaline small whitish spots, discal in 2 and 3 (often absent in ♂) apical in 6, 7 and sometimes in 8. Uph plain. Unf brown broadly overlaid whitish scales along costa and apex. Unh brown, entirely frosted whitish scales, giving a dull frosted appearance. In the ♀ the spots on F are larger and unh there is a white spot mid 5. Antennæ prominently chequered brown and white. Very like *Eogenes alcides*.

lesliei, **nov.** (30–35). Chitral at low elevations in May to July. NR. (*lesliei* is Elwes' label name in the British Museum.)

I. 53. Apostictopterus. The Giant Hopper. (Plate 31.)

Above and below dark chocolate brown, unmarked. Cilia dark brown. Wings very elongate.

**fuliginosus*, Leech. (65). Manipur and Naga Hills. W. China. VR. (=*curiosa*, Swin.)

I. 54. Astictopterus. The Forest Hoppers. (Plate 31.)

Above dark velvet brown, usually becoming paler towards the termen F; Cilia brown. Upf rarely a small discal white hyaline spot in 3; from none to 3 apical spots 6–8, which may be small and separate, prominent and conjoined or only visible unf, always more prominent in ♀♀ and DSF. Unf dark brown, dorsum pale dull brown; WSF (*jama*) apical ½ of termen broadly paler; DSF (*henrici*) costa and apex broadly dark to light ferruginous and termen broadly overlaid whitish scales. Unh WSF dark brown usually some whitish scaling about dorsum, lower part of disc and termen also the dark bands etc., present in the DSF may be more or less apparent; DSF pale ferruginous brown, more or less whitish scaled, prominent broad dark ferruginous discal band 1–6, large spot in cell, spot on either side in 7 and base 1, sometimes the spots forming the discal band are centred white scales.

α. Small form. DSF and WSF occur. DSF darker than the Indian form and with smaller apical spots F.

jama henrici, Holland (28–40). The Forest Hopper. S. and W. China, Hong Kong, Hainan. (=*chinensis*. Leech and *nubilus*, Mab.)

β. WSF large and usually with apical spots F, DSF with prominent conjoined apical spots and very prominent bands below.

jama olivascens, M. (30–40). S. India (Swin). Kumaon to Tavoy, Andamans, Siam, Tonkin. NR. (=*kada*, Swin; *unicolor*, Mab; *tonkinianus* and *permagnus*, Fruh.)

γ. Smaller, darker form, usually with no apical spots and no DSF.

jama jama, Fd. (28–35). Mergui, Malay Peninsular and islands. (a pair DSF in British Museum from Philippines). (=*melania*, Plotz; *quadripunctata*, Swin; *fuligo*, Mab.)

I. 55. Ochus. The Tiger Hopper. (Plate 31.)

Above dark velvet brown. Cilia brown, chequered yellowish at apex F and H. Upf sub-apical non-hyaline yellow band 5–8, may be reduced or absent. Unf black, costa narrowly yellow and veins at apex yellow; sub-apical yellow

I. 55. **Ochus**.—(*contd.*)

band more extensive. Unh ochreous yellow with numerous sharply defined black streaks and spots.

* *subvittatus*. M. (22–27). Kumaon to Dawnas. Tonkin. (=*subradiatus*, M. and *intricatus*, Fruh.)

I. 56. **Baracus**. The Hedge Hoppers. (Plate 31.)

Above dark brown ; upf usually with non-hyaline discal spots in 1 to 3, irregularly placed and decreasing apical spots in 6–8 (rarely outer conjoined dot in 5) ; uph plain and cilia dusky brown. Below costa and apex F and all H overlaid ochreous scales ; rest of F black.

1 (2). Unh not brown spotted ; a more or less prominent whitish or pale ochreous streak from base cell to mid termen.

α. ♂ above lower discal portion F up to discal markings and all H, except for costa and termen very pale greyish ochreous ; in ♀ dark brown, with the pale markings whitish. Unh dark ochreous brown, pale central streak prominent, whitish, and with pale streaks between veins at termen.

vittatus vittatus, Fd. (30–34). The Hedge Hopper. Ceylon. NR.

β. Above uniform dark brown ; upf markings faint. Unh central streak prominent, whitish, also a pale streak along v1 ; ground colour below brownish ochreous.

* *vittatus subditus*, M. Nilgiris and Palni Hills. NR.

γ. Above ochreous spots more prominent, especially in ♀. Unh bright ochreous, pale central streak pale ochreous and inconspicuous also broad obscure streaks between veins.

vittatus septentrionum, WM and DeN. Assam to Dawnas, NR.

2 (1). Unf bright ochreous, profusely spotted dark ochreous brown ; general appearance of alternating series of large ochreous and brown spots. Upf ochreous spots prominent, traces of a spot in the cell and some yellow scales on the costa. Unf ochreous area brown streaked between the veins.

hampsoni, El. (26–32). Hampson's Hedge Hopper. Coorg and N. Kanara, NR. (May be a low elevation race of *vittatus*, *subditus* appears to be confined to the plateaux and *hampsoni* to the low country. *plumbeola*, Fd is a small pale dull blue species from the Philippines).

I. 57. **Ampittia**. The Bush Hoppers. (Plate 31.)

Above dark brown with non-hyaline markings F and H, yellow. Upf usually discal spots in 2 and 3, apical 6–8 and a spot in cell. Unh yellow with small black spots or dark brown with yellow spots.

1a (5). Unh yellow, more or less prominently black spotted. Uph never a yellow spot in the cell.

1b (4). Upf yellow spot in 1 absent or placed centrally under spot in 2.

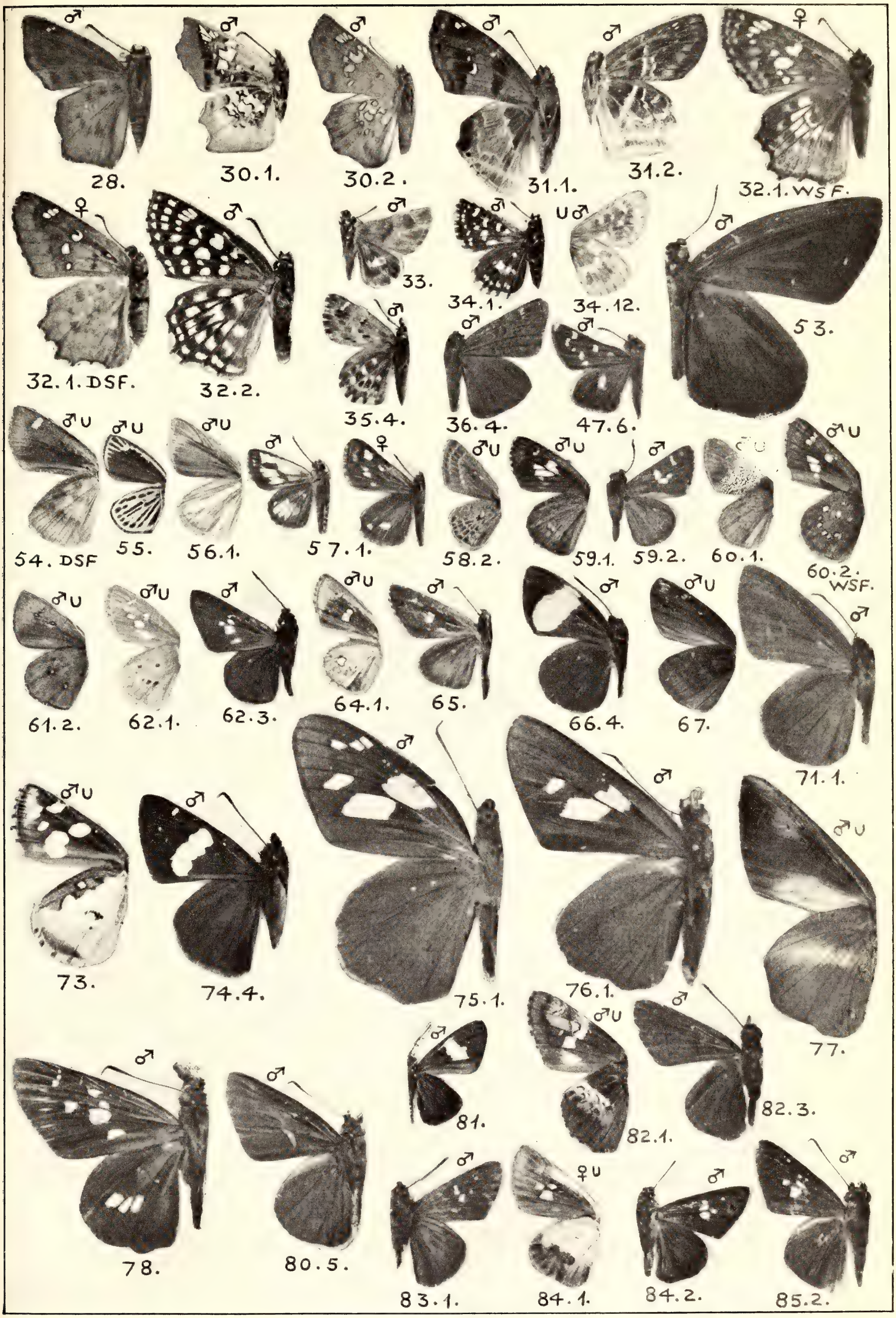
1 (2a). Upf always a prominent spot in 1 against v1. Antennal club without apiculus. ♂ upf yellow markings very wide ; entire cell and costa yellow to beyond middle, extending into bases of 1 and 2 ; spot in 1 usually large ; discal spots in 2 and 3 conjoined to a large patch ; apical spots also form large patch and may be conjoined to the costal yellow area ; narrow submarginal yellow fascia below the apex ; uph with a broad yellow discal area, divided by dark veins and extending from 1 to 5 or 6, may be detached submarginal spots in 5 and 6. ♀ very variable ; normally dark brown with small yellow spots, on upf end cell, in 1, 2 and 3 and conjoined apical in 6–8, on uph discal in 2 and 3 and submarginal in 5, but specimens occur with markings as wide as in the ♂. Unh yellow with ill-defined black spotting. ♂ brand upf prominent.

* *dioscorides*, F. (22–28). The Bush hopper. Ceylon, India, Burma, Siam, Shanghai, Tonkin, Malay Peninsular, Sumatra, Bali. C. (=*maro*, F, *camertes*, Hew and *palemonides*, Snell).

2a (1). Upf no spot in 1 against v1 (may be very faint in *virgata*). Antennal club with well-defined apiculus. Unh black spotting sharply defined.

2 (3). Upf ♂ brand very prominent and extends below v1 nearly to the termen. ♂ upf yellow markings narrow ; discal spots separate, apical conjoined ; narrow basal streak along costa and often streaks between veins behind apical spots ; lower edge cell spot continued along mv. towards base; yellow suffusion on basal ⅓ of 1. Uph suffused discal spots in 2–3 and 4–5.

virgata, Leech, (30). The Chinese Bush Hopper, C. China. R.


♂
28.
♂
30.1.
♂
30.2.
♂
31.1.
♂
31.2.
♀
32.1. WSF.
♀
32.1. DSF.
♂
32.2.
♂
33.
♂
34.1.
U♂
34.12.
♂
53.
♂
35.4.
♂
36.4.
♂
47.6.
♂U
54. DSF
♂U
55.
♂U
56.1.
♂
♀
57.1.
♂U
58.2.
♂U
59.1.
♂
59.2.
♂U
60.1.
♂U
60.2. WSF.
♂U
61.2.
♂U
62.1.
♂
62.3.
♂U
64.1.
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65.
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66.4.
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71.1.
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84.1.
♂
84.2.
♂
85.2.

I. **Hesperiidæ.** *Celænorrhinæ* (Part).
Hesperiinæ. *Pamphilinæ* (Part).

I. 57. Ampittia.—(*contd.*)

3(2). Upf ♂ brand absent or small, circular, obscure.

α. Upf conjoined discal spots in 2–3, conjoined apical 6–8, elongated spots one above the other mid cell and a streak on costa over the outer end of the upper spot. Uph prominent discal spot in 4–5 at the end cell and suffused spot in 2–3 below. No ♂ brand.

trimacula trimacula, Leech. (22–25). The Trimaculate Bush Hopper, W. China.

β. Upf markings broad as in *dioscorides* ; cell and costa entirely yellow, but not extending at base below cell and not joining the apical patch along the costa. Uph large suffused discal patch 2–5. Cilia H entirely yellow, ♂ with obscure brand.

trimacula maroides, DeN. Assam to Dawnas. R.

4 (1b). Upf always a small spot in 1 against v1, but this spot is placed well behind the discal spots in 2–3, which are small and separate ; double spot in cell, lower part longer ; separate apical spots 6–8. Uph small spots in 2 and 3 or only in 3. Unh entirely yellow, black spotting absent or very sparse. Cilia H pale yellow. No ♂ brand.

maga, Leech. (30). The Plain Bush Hopper. C. China. Malay Peninsular (Arizan, Ozaki, 2 ♀ F.M.S. Coll). (= ? *myakei* and *arisana*, Matsum and *formosana*, Fruh, Formosa).

5 (1a). Unh dark brown with prominent yellow spots in cell and bases 1 and 7, discal and submarginal series.

α. Small. Above spots obscure or absent on F and absent on H. Below dark and the spots small.

dalailama nanus, Leech. (22). The Dark Bush Hopper. China, Ichang and Ningpo.

β. Larger. Upf prominent triangular spot before end cell, discal spots in 2 and 3 close together and apical 6–8. Uph discal row 2–5.

dalailama dalailama, Mab. (30). W. China, Thibet. (=*lyde*, Leech).

I. 58. Aeromachus. The Scrub Hoppers. (Plate 31.)

Above dark brown. Below with a discal and submarginal row of small pale spots of which the discal row may show upf.

1a (5). Antennal club with a small apiculus.

1 (2a). Below the pale spots purple. Above unmarked. Unh dark brown overlaid with a few ochreous scales.

α. ♂ brand upf mid 1 to base 3. Below the spots prominent.

catocyanea catocyanea, Mab. (25–30). The Blue spotted Scrub Hopper. E. Thibet. VR.

β. ♂ brand a small fold mid v1. Below spots not prominent. Apex F produced in ♂.

catocyanea kali, DeN. Sikkim to N. Shan States. R.

2a (1). Below the pale spots yellowish white.

2 (3a). Unh beyond cell and unf at apex the veins white, at least near termen H ; often a prominent dark spot at end cell. Upf plain or with the discal spots showing. ♂ brand upf from mid 1 to base 3.

α. Wings rounded. Unf discal band sharply angled at v5. Unh clothed ochreous olive scales, but leaving very prominent postdiscal dark spots in 1–7 between the discal and submarginal pale spots ; an inner dark spot in 7 flanked by white spots and a spot end cell, the upper half of which is white. ♂ brand usually present, but vs 6 and 7 H not hair-pinned.

inachus inachus, Men. (24–32). The Veined Scrub Hopper. Japan, Amur. (=*propinquans*, Alph.).

β. Unh as *inachus*. Above and unf as *stigmata*.

inachus chinensis, El. W. China.

γ. Apex F in ♂ produced. Unf discal band evenly curved. Unh sparsely clothed olive scales, the dark markings not so prominent and sometimes not apparent, discal band not nearly so curved, the inner black spot in 7, if present, near base. ♂ with brand and vs 6 and 7 H hair-pinned.

* *inachus stigmata*, M. (22–30). Murree to Burma. NR.

3a (2). Below veins not pale. ♂ brand absent (except *piceus*) or just a fold mid 1.

I. 58. Aeromachus.—(*contd.*)

3 (4). Below discal pale spots not conspicuously larger than the submarginal. Unh clothed olive ochreous scales.

γ. ♂ with a brand.

discreta piceus, Leech (22–28). The Gray Scrub Hopper. E. Thibet.

β. ♂ no brand.

discreta discreta, Plotz. Assam to Burma, Tonkin, Malay Peninsular, Sumatra. NR.

γ. Unf markings very obscure. ? no brand.

discreta javanicus, El. Java.

4 (3). Below discal band of pale spots conspicuously wider than the submarginal series.

γ. Below dark ; unh overlaid ochreous scales, spots prominent.

jhora dubius, El. (22–28). Dingy Scrub Hopper. Palnis, Travancore, C.

β. Below brighter ; unh overlaid ochreous scales and spots prominent.

jhora jhora, DeN. Sikkim. ? to N. Burma. R. (I have not seen *jhora* from outside Sikkim nor *discreta* from W. of Assam ; it is possible that they are conspecific since the genitalia are alike).

5 (1a). Antennal club without apiculus. Wings rounded, small. Below markings obscure ; unh overlaid olive grey scales.

γ. ♂ no brand.

pygmæus pygmæus, Fab. (20–22). The Pigmy Scrub Hopper. S. India. Assam to Burma, Malay Peninsular, Sumatra. NR. (=*indistincta* and *obsoleta*, M).

β. ♂ with brand.

pygmæus musca, Mab. Luzon.

I. 59. Pedestes. The Bush Bobs. (Plate 31.)

Above with hyaline spots on F only.

Ia (3). Upf with spot across cell, discal spot in 3 and a larger one in 2 running below the above two ; 3 apical spots in 6–8.

1 (2). Above blue-black, central hyaline spots large and white, spot in 3 to base 3. Below costa and apex F and all H overlaid olive ochreous scales. Unh small white discal spots in 2 and 3.

**masuriensis*, M. (30–32). The Mussoorie Bush Bob. Mussoorie to Assam. NR.

2 (1). Above dark brown, hyaline spots pale yellow, smaller, spot in 3 not to base 3. Below costa and apex F and all H overlaid ochreous scales. Unh unmarked, but faint traces of discal spots are sometimes visible. In a not infrequent variety the discal spots in 2 and 3 upf are widely separated from the cell spot.

* *pandita*, DeN. (25–30). The brown Bush Bob. Sikkim to N. Burma. NR. (=? *tali*, Swin, Haut Yunnan and *parnaca*, Fruh, Tonkin).

3 (1a). Upf with 2 spots end cell, 3 discal, 3 apical. Unh dull red brown, several basal and a curved discal row of indistinct black spots.

bononoides, Druce. (34). Sarawak. (Not examined by me ; placed by Druce in *Pedestes*, but position doubtful).

I. 60. Arnetta. The Bobs. (Plate 31.)

1a (3a). Above dark brown with small hyaline white spots upf, upper edge cell (may be absent in *vindhiana*), discal in 2 and 3 close together, apical 6–8 minute. Unh with more or less complete set of small white spots, discal row 1–7, base 7, mid cell, base 1 (double).

1 (2). ♂ unf no tuft. Unh ochreous brown to greenish ochreous, spots obscure.

* *vindhiana*. M. (25–32). The Vindhyan Bob. S to C. India. NR. (=*nilgiriana*, and *modesta*, M).

2 (1). ♂ unf with a tuft of black hairs mid dorsum and v1 distorted in middle. WSF unh dark brown, clothed dark ochreous scales with spots very prominent. DSF pale to dark brick red more or less clothed whitish scales, spots small and sometimes incomplete.

* *atkinsoni*, M. (25–32). Atkinson's Bob. Sikkim to Tavoy. NR. (= *subtestaceus and khasianus*, M.)

3a (1a). Unmarked above and unh,

I. 60. Arnetta.—(*contd.*)

3 (4). Unf unmarked except for dorsum being paler. Above and unh dark rich brown. ♂ with black tuft unf and v1. distorted as in *atkinsoni.*

kala **nov.** (30). Sumatra. (Described from 1 ♂ of which the antennæ and palpi are missing, but the genitalia are very similar to *atkinsoni*; in general appearance the insect resembles *Itys iadera* and *Iambrix unicolor*).

4 (3). Unf with a conspicuous triangular apical orange yellow patch from 6–8. Unf costa and apex and unh very sparsely overlaid with conspicuous ochreous scales.

verones, Hew. (31). Sumatra. Kuala Tahan, Pahang (Singapore Museum). (Usually considered as a variety of *Koruthaialos rubecula*, but is structurally quite different; the palpi antennæ and venation show a close alliance with *atkinsoni* and the genitalia though peculiar, are allied).

I. 61 Iambrix. The Bobs. (Plate 31.)

Normally without hyaline spots except sometimes in the ♀ of *salsala* on upf and in *tytleri.*

1a (4a). Unh with small silver spots. ♂ no brand.

1 (2a). Upf with prominent pale yellow hyaline spots, large spot towards end cell, tapering towards scv., larger spot in 2 with its inner edge in line with the inner edge of the cell spot, may be a dot in 3, apical spots 6–8, non-hyaline spot in 1 against v1. Below costa and apex F and all H overlaid bright ferruginous ochreous scales; unf the spots white and the dorsum pale; unh prominent small silver spots in 2, 3, 5, 7 and cell, more or less black edged and some black streaks towards the margin.

tytleri, Evans. (28). Tytler's Bob. Naga Hills, Siam, Borneo. VR. (= *wooiletti*, Riley).

2a (1l). Upf no prominent hyaline spots (except ♀ *salsala* which never has a spot in the cell).

2 (3). Unh black edged silver spots in 1, 5 and 7, that in 5 most prominent; rarely a faint spot in cell, but never so prominent as the spot in 5; spots in 1 and 7 often faint or absent. Above dark brown with some dark ochreous scaling on F, which in ♂ forms a more or less apparent series of discal spots; in ♀ these spots are more or less replaced by a non-hyaline spot in 1 and a series of hyaline spots in 1–8, bent in at v6. Unf costa and apex and all unh densely clothed ferruginous ochreous scales; unf in ♂ a more or less prominent silver spot end cell against upper edge and two small discal spots in 4 and 5.

α. Smaller. Upf ♂ only ochreous spots in 1 and 2.

salsala luteipalpus, Plotz. (26–30). The Chestnut Bob. Ceylon. South India. C.

β. Larger. Upf very variable, but usually discal spots in 1 and 2 are obscure, those in 3–6 being more conspicuous.

* *salsala salsala*, M. Sikkim to Burma, China, Siam, Malay Peninsular and Islands. C. (= *vasuba*, Fruh, Tonkin).

3 (2). Unh normally with small silver spots in 1 (double), 2, 5 and mid cell, the spot in cell as prominent as the spot in 5. Above much darker velvet brown, very little ochreous scaling about apex F and no formed spots. Unf costa and apex and all unh overlaid dark ochreous: unf silver cell spot present, spots in 4 and 5 usually absent.

stellifer, But. (24–28). The Malay Chestnut Bob. Karens to South Burma. Annam, Malay Peninsular and Islands. Philippines. NR. (= *niasicus*, Fruh).

4a (1a). Unh unmarked. ♂ upf a glandular streak along 2nd quarter of v1 from base, the vein being slightly deflected.

4 (5a). Above unmarked dark velvet brown, paler in ♀. Below as above; unf lower discal area to dorsum paler.

unicolor, DeN. (31). Perak, Pahang, Malacca, Sarawak. R.

5a (4). Upf with red discal band. Below costa and apex F and all H overlaid dark ochreous scales. ♂ unf a thin tuft of hairs mid dorsum overlying a black and white brand in 1; uph scales above cell to costa modified.

4 (5). Upf red band dull, narrow, appears composed of densely packed dark ochreous scales, does not extend into 1 and is not wider than the dark termen.

I. 61. Iambrix.—(*contd.*)

sindu, Fd. (25–28). The Small Red Bob. South Mergui VR. Malay Peninsular and Islands. NR. (= *obliquans*, Mab. and *yamanta*, Fruh. Felder's types of *sindu* at Tring are ♂ *Koruthaialos rubecula* and ♀ *kophene*; he describes *sindu* as near *Astictopterus jama*, but smaller; Felder's type of *jama* at Tring is *Koruthaialos xanites*, but his description refers to an insect without any markings; the conclusion is that the Tring types are unreliable).

5 (4). Upf red band much broader, clearer and brighter, much broader than the dark terminal area and extends into 1; in ♀ it extends into cell, the end of which is marked by a dark line.

latifascia, El. (27–30). Borneo. Sumatra (Fruh). Pahang (F.M.S. Museum).

I. 62. Suastus. The Palm Bobs. (Plate 31.)

Above dark brown, with or without hyaline spots F. Unh usually with dark spots.

1 (2a). Unh grey (brown, overlaid greyish ochreous scales) with a variable number of sharply defined black spots; spot against upper outer edge of cell always present and as large as any other spot; discal series 1, 2, 3, 5 (usually absent) and 6. Upf hyaline white spots usually prominent, but may be small or absent; spot across cell beyond middle (lower part often absent), spot in 3 and large spot in 2 with its inner edge under the centre of the cell spot and its outer edge under the inner edge of the spot in 3; apical spots 6–8; usually non-hyaline lower spot in 1 and sometimes an upper dot. Unf apex and costa grey and there may be some black spotting at apex. Cilia grey. Size very variable.

α. Much darker above and below dark grey.

gremius subgrisea, M. (32–42). The Indian Palm Bob. Ceylon. C.

β. Generally paler.

* *gremius gremius*, F. India, Burma, South China (= *divodasa*, M; *robsonii*, DeN; *nigroguttata*, Matsum, Formosa).

2a. (1). Unh with obscure ill defined, suffused black spots in a decreasing row from 1–3, 6 and upper edge of cell; spot in 1 always present and larger than the rest.

2b. (4) Uph no white about the tornus.

2 (3). Above black, unmarked. Cila F brown; H white, chequered brown. Unf a white patch mid 1; unh white to v6 and scv., some obscure brown marginal spots.

minuta, M. (28–32). The Ceylon Palm Bob. Ceylon. NR. (= *sinhalus*, Plotz).

3 (2). Above dark brown with hyaline spots F.

α. Upf small hyaline spots in 2 and 3, rarely a dot in 6. Cilia brown. below with more or less purple sheen; apex and costa F and all H overlaid sparse grey white scales, general appearance dark grey brown. Unf obscure discal white area in 1.

rama bipunctus, Swin. (26–34). The Small Palm Bob. Nilgiris. R.

β. Upf always hyaline spots in 2 and 5 and usually a double (or single lower) spot in cell and a spot in 6; the discal spots much closer together than in *gremius*. inner edges of spot in 2 and cell spot in line; traces of spot in 1 against v1, which unf shows as a broad white patch extending across 1. Cilia narrowly white becoming brown at apex F. Below white scaling much denser, general appearance pale grey.

rama rama, Mab. Bengal, Sikkim to Tavoy R. (= *sala* Auct nec. Hew; true *sala* is a *Plastingia*).

α. Above spots prominent. Cilia H grey, brown at apex H and on F. Below apex and costa F and all H overlaid pale ochreous scales; unf white area mid 1 more extensive, reaching dorsum.

* *rama aditus*, M. Andaman and Coco Islands. R.

4 (2a). Uph with white tornal area. Above black, no spots upf (may be faint in race *scopas*). Cilia white to apex H. Below as *minuta*.

α. Uph white area narrow and irregular, most extensive along vs 1a and 1, not reaching dorsum.

everyx everyx, Mab. (26–34). The Malay Palm Bob. Tavoy, VR. Malay Peninsular, Sumatra, Pulo Laut, Borneo. (=*tripura*, DeN).

I. 62. Suastus.—(*contd.*)

β. Uph white tornal area regular and sharp defined, extending ¼ along termen and dorsum.

everyx scopas, Stg. Java, Bali and Philippines. (=*albescens*, Mab. ; *migreus*, Semp. ; *chilon*, Doh, Sumba).

(*plana*, Swin, New Guinea, is described as belonging to this genus).

I. 63. Inessa. DeNicèville's Bob.

Above dark brown with a conspicuous purple gloss. Upf double spot in cell, lower portion prolonged nearly to base ; small non-hyaline spot in 1 against v1, spots in 2 and 3 and dots nearer margin in 4 and 5, apical in 6–8. Uph small spot mid cell ; continuous discal band 1–5, separated by veins and spots composing it elongate and irregular. Below as above but no purple sheen.

ilion, DeN. (32). Lombok. VR.

I. 64. Scobura. The Forest Bobs. (Plate 31.)

Above dark brown with hyaline spots F and H ; upf always non-hyaline spot in 1 against v1, large spot in 2, double spot in cell, of which the upper part is smaller and may be absent, apical spots 6–8 (may be incomplete).

1a (3a). Upf no spot in 3 (rarely a dot in *cephala*) and the cell spot is immediately over the spot in 2. Uph large double hyaline spot in 4–5 and smaller one in 2 (may be absent). Cilia grey on H.

1 (2). Upf usually a small spot in 4. Unf costa and apex and all H greenish yellow. Unh there may be 3 small white spots in 1, 3 and 6 against the larger spots in 2, 4–5 and the spots are usually chestnut edged ; in ♀ the chestnut colour is very pronounced and usually occupies the whole area from the spots to the termen and on the apex upf.

* *cephala*, Hew. (27–36). The Forest Bob. Sikkim to Burma, Malay Peninsular, Sumatra and Borneo. NR. (=*isota*, Swins.).

2 (1). Upf never a spot in 4. Uph spot in 4–5 always large and spot in 2 obscure or absent. Unf apex and costa and all H overlaid greyish green. Unh spots black edged and often a discal row of black spots and 2 spots in the cell, also black.

phiditia, Hew. (32) The Malay Forest Bob. Manipur to Burma. Malay Peninsular and Sumatra. Borneo. R. (=*martini*, El).

3a (1a). Upf prominent spot in 3.

3 (4). Upf no spots in 4 and 5, spot in 2 shifted out. Uph small equal hyaline spots in 2, 3 and sometimes 5, spot in 3 much nearer margin. Below basal half costa F and basal half H bright yellow ; apex F and outer half H bright chestnut ; unh small dark ringed white spots in 1, 2, 3, 5, 6 and dark spot base 7 (may be absent).

cephaloides, DeN. (36–40). The Large Forest Bob. Sikkim to Burma. Tonkin and Hainan. R.

4 (3). Upf figure of 8 spot in the cell, large spot base 2, small spots 1, 3, 4, 5 and 6–8. Uph a spot in 2 and a double spot in 4–5. Unh and apex unf veins pale.

coniata, Hering. China. (? = ab of *cephala*).

I. 65. Suada. The Grass Bobs. (Plate 31.)

Above brown with hyaline white spots F, typically prominent lower spot in cell, large spots in 2 immediately below it, dot base 3, apical spots 6–8 and an elongate non-hyaline spot along mid v1. Unh unmarked.

α. F spots prominent ; uph rather paler mid disc. Unf apex broadly and all H clothed dense olive ochreous scales.

* *swerga swerga*, DeN. (32–36). Sikkim to Burma, Malay Peninsular. Sumatra. NR. (=*moelleri*, M).

β. F spots prominent. Larger. Uph much paler mid disc in ♂ and in ♀ whitish, costa broadly and termen narrowly brown. Unf apex brown above v6 and then decreasingly white to tornus ; unh all white to narrow brown costa.

swerga triplex, Pl. Java. (Plotz gives no locality and I prefer to use his name for the Javan race rather than invent a new name.)

I. 65. Suada—(*contd.*)

γ. F spots on disc small, separate and may be absent. Uph tornus broadly pure white extending half-way along dorsum and termen. Unf and unh as *triplex*.

swerga cataleucos, Stg. Borneo, Pulo Laut, Philippines. (=*albinus* Semp).

I. 66. Koruthaialos. The Velvet Bobs. (Plate 31.)

Above and below dark brown, no spots but usually with a prominent red discal band upf and unf ; unh no scaling.

1a (3a). Palpi third joint long and thin.

1 (2). Upf discal red band sharply defined, 3 mm. wide, clear red and extending from upper edge of cell (or just beyond) to v2 (or just beyond). Upf band rather more extensive at either end, sides straight and parallel or convergent posteriorly. A fairly constant form.

rubecula, Plotz. (32–37). The Narrow-banded Velvet Bob. Assam to Burma. Malay Peninsular and Islands, Philippines, Luzon, Natuna and Celebes. C. (=*hector*, Wat and *namata*, Fruh. I have verified true *rubecula* from Assam to Malay Peninsular and Sumatra, but the other localities require check).

2 (1). Upf discal band absent, just indicated or sullied.

α. Upf unmarked ; unf usually some faint red suffusion at upper end of cell and in ♀ a dusky suffused band.

butleri butleri, WM. (32–37). The Dark Velvet Bob. Sikkim to N. Burma. R. (I have verified the type specimen in the Indian Museum.)

β. Upf discal band sullied, dull, 2 mm. wide, from upper end cell to v3 or 2, dcv. prominently black. Unf variable, may be a trace of red only at end cell or a dusky red band from costa to below v1.

butleri avidha, Fruh. S. Burma. S. Annam. NR.

γ. Upf unmarked or with traces of a red spot at end cell. Unf a large dusky red area about upper edge of cell and a detached smaller area about base 3 (may be absent).

butleri niasicus, Fruh. Sumatra, Nias.

δ. Larger, otherwise as last.

butleri haraka, Fruh. Java.

3a (1a). Palpi third joint short, stouter, just protruding.

3b (5). Upf always a red band.

3 (4). Unf discal red band divided by dark veins, discontinuous at v1 and the red area is extensive in 1. Upf band dusky red, divided by dark veins and the dcv. black, extends from costa to tornus, 2 mm. wide in ♂, 5 mm. in ♀. Large.

focula, Plotz. (46–52). The Large Velvet Bob. Sumatra, Java. R. (=*kophene*, DeN).

4 (3). Unf discal red band not divided by black veins, extends from costa to dorsum and is more or less equally wide throughout, broad and clear red, inner edge below cell always concave.

α. Upf band orange red, from costa to tornus, usually wide (5 mm., but may be as narrow as 3 mm. and stop at v3 ; on unf in narrow banded specimens the inner edge of the band is irregular, but always concave). ♀ unh ochreous brown.

* *xanites gopaka*, Fruh. (34–40). The Bright Red Velvet Bob. Assam to Burma. Tonkin. NR.

β. Larger. Upf band deeper red and always broad.

xanites xanites, But. (37–41). S. Burma. Malay Peninsular. Borneo and Philippines. NR. (=*lætitia*, Plotz ; *palawites*, Stg. ; *luzonensis*, Fruh).

γ. As last but larger still.

xanites kerala, DeN. (49). Sumatra.

δ. Upf discal band very dark red and reduced, may consist of only of a spot end cell. Unh band as broad as usual.

xanites javanites, Stg. (36–39). Java, Bali, Batu.

5 (3*b*). Above and below dark brown with a purple plum suffusion, no traces of a red band ; Unf dorsum broadly pale pinkish brown. F v11 not so close to v12.

nigerrima, Swin. (36–42). The Plain Velvet Bob. Assam to S. Shan States. R. (I have verified the type.)

I. 67. Sancus. The Coon. (Plate 31.)

Above dark shining brown, unmarked. Below dark brown, dorsum F pale ; on apex F a narrow oblique purple white patch, small whitish post-discal spots in 4 and 5 and subapical in 6–9. Unh dorsum broadly pale brown, a purple grey area about end cell, separated from a similar broad marginal area by discal spots in a straight line from 2–5, spots in 6, 7 and in middle of upper edge of cell.

α. The markings below prominent.

* *pulligo subfasciatus*, M. (36–46). South India, Cachar to Burma, Siam, Annam. Malay Peninsular. C.

β. Larger. Below the purple grey areas absent, the spots dull yellow.

pulligo pulligo, Mab. Sumatra, Java, Borneo and Bali. (= *forensis*, Plotz. *kethra*, Plotz = *ulunda*, Stg. is the Philippine race and *fuscula* Snellen = *cellundo*, Stg., the race from the Celebes).

I. 68. Watsoniella. Watson's Demon.

Above dark brown unmarked, becoming outwardly paler on F, in ♀ broadly and very markedly so. Below similar, but paler and unf dorsum to v2 very pale brown. Very like *Kerana diocles*.

swinhoei, Elwes. (48–50). Sikkim to Burma. R.

I. 69. Ge. The Circular Tufted Demon.

♂ above uniform dark brown, cilia grey ; ♀ with pale yellow discal spots in 2 and 3 and apical in 6–8, conspicuously paler beyond the spots ; uph in ♂ centrally paler. Below dark brown, dorsum F pale brown ; in ♀ the outer half of the wing is conspicuously very pale brownish yellow.

geta, DeN. (35–37). S. Mergui. Malay Peninsular Sumatra, Batu, Java and Borneo. VR.

I. 71. Kerana. The Demons. (Plate 31.)

Above dark brown with or without a red band F.

1 (2*a*). Above dark brown unmarked, cilia brown ; ♂ no brand. Below dark brown, termen F and H broadly paler ; on H the basal area is also paler, leaving a dark chocolate costa and discal band to v1 ; costa and apex F and all H clothed inconspicuous ochreous scales. F v5 bent at origin.

* *nigrita*, God. (48–60). The Chocolate Demon. Bengal, Kumaon to Burma, Siam, Malay Peninsula and Islands, Philippines. C. & Individuals from the Malay Islands have a more or less prominent whitish curved sub-apical fascia unf.

(= *diocles*, M ; *maura*, Snell ; *fumatus*, Mab. ; *evaira*, *sumata*, *prabha*, Fruh).

2a (1). Upf broad red discal band (may be absent in *niasana*).

2b (5). F v5 bent down at origin. Body dark brown.

2 (3a). Below no spots. ♂ unf towards base a large black velvet patch from v1 to mid cell ; uph a similar patch filling the cell.

α. Upf a very broad orange red discal band from mid costa to tornus at v1 ; narrower at costa and indented at the origin of v5.

armata armata, Druce. (49–60). The Red Demon. S. Mergui, VR. Malay Peninsula, Sumatra and Borneo.

β. Upf, band absent, obscure or broken into spots.

armata niasana, **nov.** Nias.

3a (2). Below with curious glistening pale purple spots only visible in a side light ; unf in cell just before the red band, sub-apical in 5, 6 and 7, unh discal in 2, 3, 5 and 6. Upf and unf a broad orange red band from mid costa to v1 at tornus.

3 (4). Upf the red band narrows towards costa.

gemmifer, But. (35–38). The Gem Demon. Tavoy to S. Burma, Malay Peninsula, Sumatra, Borneo, Natuna, Philippines. R. (= *dombya*, Fruh).

4 (3). Upf discal band broadens towards costa.

vajrada, Fruh. (36). Fruhstorfer's Demon. Borneo. VR.

5 (2b). F v5 only slightly bent down at origin. ♂ upf a very broad orange yellow band from mid costa below the scv. to mid dorsum ; at v2 it is curved in and nearly reaches the base. Thorax and base H clothed orange yellow hairs.

I. 71. Kerana.—(*contd.*)

Abdomen with narrow white rings. Unf discal band to costa. In ♀ upf the red band is not continued towards the base posteriorly and the yellow hairs on the thorax and at base H are absent, very like *xanites*.

fulgur, Den. (37). The Yellow Demon. Malay Peninsular, Sumatra and Borneo. VR. (I am not satisfied with the position of this species but have only been able to examine damaged specimens.)

I. 73. Udaspes. The Grass Demon. (Plate 31.)

1 (2). Above dark brown with large hyaline white spots ; upf a spot across cell, conjoined to a bent spot in 1–2, small detached spot in 3, conjoined spots in 4 and 5, conjoined sub-apical spots in 6–8 ; uph a large central hyaline area in 1–6. Cilia chequered brown and white. Antennæ white banded below club. Below dark brown, apex F, dorsum and termen H overlaid pale whitish scales, which on H leave a large dark spot mid 1 to base 2. Considerable seasonal variation in the colouring below.

* *folus*, Cr. (40–48). Ceylon, India, Kangra to Burma, Siam, China, Malay Peninsular and Islands C. (= *cicero*, Fab.)

2 (1). Uph a prominent white spot in 4–5 and a small spot base 3. Unh striated.

stellatta, ob. (40–45). The Thibetan Grass Demon. Maenia, E. Thibet. VR.

I. 74. Notocrypta. The Banded Demons. (Plate 31.)

Above black ; upf a broad curved hyaline white discal band consisting of large conjoined spots in 1, 2 and cell. Below dark brown usually with some whitish scaling on the paler areas at the apical part of the termen F and the dorsal portion H also on H from mid end cell to mid v1 ; often some ochreous scaling between band and apex on F and on basal half of H. Antennæ white banded below beginning of a club or only white streaked below.

1a (4a). F no traces of sub-apical spots in 6–8 ; never a well-defined spot in base 3 (only in *renardi*). Unf a yellow costal patch at end of the band.

1 (2a). F discal band very wide, width = basal black area and placed nearer base than apex, more compact and straighter than usual ; unspotted except very rarely a faint dot mid 4 unf. F much squarer than usual, termen at right angles to dorsum. Below with more or less white scaling.

quadrata, Elwes. (40–45). The Broad banded Demon. Malay Peninsular, Borneo. R.

2a (1). F discal band narrower and placed rather nearer apex than base. F dorsum at an angle of 120 to 150 to termen.

2 (3). F unmarked except for the discal band. Apex F produced. Below white scaling only traceable at apex F, but margins broadly paler brown, also centre of disc H, thus resembling *Kerana nigrita*.

α. F discal band broad and compact.

volux volux, Mab. (39–42). The Dark banded Demon. Karens to S. Burma, Siam, Malay Peninsular and Islands, Philippines. NR. (This is a common species in S. Burma and passes as *albifascia*, which is a *Hyarotis* ; figured in Lep. Ind. as *albifascia* ; the correct name and synonymy in this and other species in this genus is doubtful.)

β. F discal band narrow, tending to be macular and the spot in 1 may be absent.

volux niasana, **nov.** Nias.

3 (2). F almost invariably a prominent spot mid 4, if not visible upf may show unf ; very rarely a dot mid 5 and there may be a dot mid 3 against v3. Wings rounded and band more curved than usual.

α. Below white scaling usually prominent. Unh no silver spots.

paralysos alysia, **nov.** (33-40). The Common Banded Demon. Ceylon, S. India, Mussoorie to Karens. C.

β. Below white scaling faint and usually obsolete.

paralysos devadatta, Fruh. Dawnas to S. Burma, Malay Peninsular, Sumatra, Nias. C.

γ. Darker, larger, wings rather more pointed. Below very little or no white scaling.

I. 74. Notocrypta.—(*contd*).

paralysos sidha, Fruh. Java. (= *asanga*, Fruh. and *sukavata*, Fruh. Sumbawa).

δ. Unh a prominent silver spot mid cell and small spots in 2 and 5. Larger, band broader; below white scaling faint.

paralysos paralysos, WM. Andamans. NR.

(The race from the Philippines and Celebes is *clavata*, Stg.=*chunda* and *yaya*, Fruh.).

4a (1a). F always with 2 or 3 sub-apical spots, which are at least traceable unf; usually small spots mid 3, 4 and 5.

4 (5). Unf the discal band continued to costa by a more or less well developed yellowish white patch. The white spotting and scaling below is very variable; local races are very difficult to define.

α Small. Spotting and scaling variable.

* *feisthamelii alysos*, M. (38–50). The Spotted Demon. Murree to Burma. W. China, Siam, Malay Peninsular, Sumatra and Borneo. C. (=*rectifasciata*, Leech).

β. Larger. White spotting and scaling below prominent.

feisthamelii avattana, Fruh. Java, Lombok and Sumbawa. (=*samyutta* and *dharana*, Fruh. The Philippine race is *alinkara*, Fruh and the Celebes race *celebensis*, Stg. Race *feisthamelii*, Bdv., flies from the Moluccas to Queensland and = *varians* and *chimaera*, Plotz.; *padhana*, *samana* and *satra*, Fruh.; ? *klossii*, Roth).

5 (4). Unf discal band not continued above scv. Above spotting and below white scaling prominent. Apical spots conjoined.

curvifascia, Fd. (38–50). The Restricted Demon. Ceylon, S. India, Sikkim to Burma, China, Andamans, Siam, Malay Peninsular, Sumatra. ? Java, Borneo and Philippines. C. (=*restricta*, M.).

(An allied species, *renardi*, Oz., with many named forms and possibly comprising more than one species flies from the Moluccas to Australia; it differs principally in having a well defined spot at base 3 and the spot in 1 tends to be detached).

I. 75. Gangara. The Giant Redeye. (Plate 31.)

Above brown with large discal hyaline yellow spots on F, across cell, in 2 and 3. Below some blue white scaling at apex F and bands composed of similar scales on H.

1 (2). F with apical spots in 6—8, spot in 6 out of line, nearer margin; spot in 3 against mid v4. Cilia H grey at apex.

α. Normally with a small non-hyaline spot in 1 against v1 under the spot in 2.

thyrsis clothilda, H5. (70–76). The Giant Redeye. Ceylon. NR.

β. No spot in 1.

* *thyrsis thyrsis*, F. India. Sikkim to Burma, Siam, Tonkin, Malay Peninsular and Islands. NR. (=*pandia*, Fruh).

γ. F spot in 2 not to base of v3; in other races spot in 2 is larger and reaches to middle of cell spot.

thyrsis yasodara, Fruh. Andamans.

δ. Upf only 2 apical spots in ♂.

thyrsis philippensis. Fruh. Philippines.

2 (1). F no apical spots; discal spots differently placed, spot in 3 reaches to behind origin of v4 and nearly to origin of v3; spot in 2 against mid v3 and not near cell spot. Unh a white spot near base 7. ♂ upf the glandular streak absent; unf yellow tuft present.

saguinocculus, Martin. (65–70). Martin's Redeye. Malay Peninsular, Sumatra, Borneo. R.

I. 76. Erionota. The Palm Redeye. (Plate 31.)

Above brown with large hyaline yellow discal spots on F, in cell, 2 and 3; spot in 3 against mid v4.

1 (2). Upf no hyaline spots (very rarely faint); spot in 2 reaches to middle (or further) of spot in cell. Unh pale to dark brown with an irregular, often obscure, paler discal area.

I. 76. Erionota.—(*contd.*)

α. Upf hyaline spots and apex white.
thrax grandis, Leech. (70–76). The Palm Redeye. W. China. VR.
β. Upf hyaline spots yellow.
* *thrax thrax*, L. S. India. Dun to Burma. Siam, Malay Peninsular and Islands, Philippines. NR.
γ. Smaller. Apex F above more or less white; antennæ below club much whiter and cilia above whitish. Unf a white apical patch.
thrax acroleuca, WM. and DeN. (52–55). Andamans and Nicobars. NR. Occurs as a scarce variety of *thrax* in Assam to Burma, Malay Peninsular and Borneo. (= *hiraca*, M and *lara*, Swin).
(*alexandra*, Semp, is a race or perhaps species from Luzon. *sakita*, Ribbe is the Celebes race and the Moluccan is *hasdrubal*, Fruh).
2 (1). Upf with a hyaline spot in 6–8, spot in 6 pushed out (not so much as in *thyrsis*); spot in 2 does not reach to the middle of the cell spot; apex may be more or less white tipped. Unf sub-apical pale area. Unh dark brown with a more or less purple gloss, margin broadly paler, conjoined irregular violet white spots about end cell and from 1–7, also a spot at extreme base cell and sometimes a spot near termen in 1.
sybirita, Hew. (60–70). The Sybarite Redeye. S. Mergui, VR. Malay Peninsular, Borneo and New Guinea.

I. 77. Paduka. The Banded Redeye, (Plate 31.)

♂ above dark brown, unmarked. ♀ with large hyaline yellow discal spots in cell, 2 and 3, spot in 2 with its inner edge against middle of cell spot and its outer edge against inner edge of spot in 3, which is against mid v4; small non-hyaline spot in 1 against spot in 2. Unf pale sub-apical area, overlaid sparse white scales and a more or less prominent spot on 7; dorsum whitish. Unh a broad prominent transverse band of violet white scales from v1 below cell to apex and expanding towards apex. Cilia above pale yellow.
α. Unh transverse band well defined throughout, violet white.
* *lebadea subfasciata*, M. (62–68). Ceylon. R.
β. Unh as last; no trace of the spot in 7 unf.
lebadea glandulosa, Dist. Sikkim to Burma, Tonkin, Malay Peninsular, Sumatra and Java. VR.
γ. Unh transverse band silvery white, dense from v1 to end cell and thence sparse, extending to middle of disc. Unf scaling to apex. ♀ spots whiter, smaller and more separated, spot in 1 larger.
lebadea andamanica, WM. Andamans. R.
δ. Upf ♂ brand more distinct. ♀ no spot in 1 upf.
lebadea lebadea, Hew. Borneo, Pulo Laut. R.
(*toradja*, Fruh. is apparently a distinct species from the Celebes, with 3 large white spots upf and some grey scaling unh, not forming bands).

I. 78. Pudicitia. The Spotted Redeye, (Plate 34.)

Above brown with large yellow hyaline spots F and H. Upf 2 spots in cell (lower nearer base and behind origin of v3) large spot in 2 immediately below, spot in 3, ⅓ along v4; apical spots 6–8 in line; semi-hyaline spot above middle of v1 replaced by a yellow patch unf. Uph 3 hyaline yellow discal spots in 2, 3 and 4–5. Below as above.
* *pholus*, Den. (58–64). The Spotted Redeye. Bhutan to Naga Hills. VR.

I. 79. Matapoides. The Tufted Redeye.

Above dark brown; upf a green streak in certain lights below v2; otherwise unmarked; cilia orange at tornus H. Below rich dark brown, unmarked; unf ♂ a brand on the nacreous area mid 1. H lobed.
smaragdinus, Druce. (60). Borneo. VR.

I. 80. Matapa. The Branded Redeye. (Plate 31).

Unmarked dark brown.
1 (2a). H. cilia grey or very pale yellow. Unh warm ferruginous brown. ♂ brand black, obscure.

I. 80. **Matapa.**—(*contd.*)

aria, M. (40–45). The Common Redeye. Ceylon, S. India to Dun to Burma, Andamans, China, Hainan, Siam, Tonkin, Malay Peninsular and Islands to Philippines. C. (= *pulla*, Plotz and *neglecta*, Mab.).

2a (1). H cilia and tip of abdomen bright orange.

2b (4b). ♂ brand black, obscure.

2 (3). Above purple glossed, especially at apex F. ♀ body and base wings clothed metallic bluish hairs. ♂ below dark brown, apex and dorsum F paler ; ♀ uniform pale brown.

purpurascens, El. (48–54). The Purple Redeye. Sikkim to Karens. Tonkin, Sumatra, Borneo, R.

3 (2). Above no purple gloss, apex F grey. Below ochreous brown ; apex and mid dorsum F and base H very pale brown.

druna. M. (48–54). The Dark-brand Redeye. Sikkim to Burma. Andamans, Malay Peninsular and Islands. NR.

4a (2b). ♂ brand grey and prominent.

4 (5). Below dull dark brown, veins conspicuously black.

sasivarna, M. (40–47). The Black-veined Redeye. Sikkim to Burma, Malay Peninsular, Sumatra, Pulo Laut. NR.

5 (4). Below ♂ dark ferruginous brown ; ♀ pale yellow brown. Upf and unf apex rather paler.

* *shalgrama*, M. (46–52). The Grey-brand Redeye. Sikkim to Burma, Andamans, Tonkin, Java, Bali, Pulo Laut. NR.

(*celsina*, Fd. with a tear-shaped brand occurs in the Philippines, Celebes and Moluccas. It = *hyrmina*, Hew : *assur*, Mab and *ractaya*, Fruh).

I. 81. **Oerane.** The Demon Flitter. (Plate 31.)

Above black ; upf compact broad white central band from upper edge cell to mid v2 and a small conjoined spot base 3 ; no apicals pots or spot in 1 or on H. Below dark brown, dorsum F paler ; apex F and all H very sparsely overlaid greenish ochreous scales ; unf discal band is continued in ♂ to v12 by greenish ochreous scales and in ♀ by white scales. ♀ paler and with wider band.

* *neaera*, DeN. (28–34). Dawnas to S. Burma. Malay Peninsular and Islands. R. (= *pusilla*, Fruh. *drymo*, Mab. is a variety with the spot in 3 missing. *microthyrus*, Mab. is the race from the Philippines. In Rhop Java the ♀ is figured as unmarked).

I. 82. **Hyarotis.** The Flitters. (Plate 31.)

1 (2a). Cilia broadly chequered white and brown ; antennæ white banded before apiculus. Above dark brown ; upf with white hyaline spots, across cell, in 1 (non-hyaline) against v1, discal in 2 and 3, apical 6–8. Below dark brown, outer half dark ochreous, bearing centrally a broad diffused dark brown band ; unf cell spot continued to costa and spot in 1 diffused : unh an irregular broken central white band from v1 across end cell to v8.

α. Upf spots small, those in cell and in 2 do not overlap.

adrastus adrastus. Cr. (38-48). The Tree Flitter. Ceylon, S. India. NR. (= *phoenicis*, Hew).

β. Upf spots larger, those in 2 and 3 overlapping.

* *adrastus praba*. M. Kangra to Burma, Andamans, Siam, Hong Kong. NR.

(*meluchus*, Fruh is the race from the Malay Peninsular. Pulo Condor, Sumatra, Borneo and Java. *mindanensis* and *palawensis*, Fr., the Philippine races).

2a (1). Cilia uniform dark brown ; antennæ plain brown. (White under club in ♀♀ and ♂ *pria*).

2 (3a). Unh base dark golden yellow. Upf and unf large hyaline white spot across cell, joined to a still larger spot in 2. Otherwise unmarked.

basiflava, DeN. (38–48). The Golden Flitter. S. India. R.

3a (2). Unh unmarked.

3 (4). ♂ upf with a hyaline white discal band consisting of a large spot across cell conjoined to an equally large spot in 2, which extends (non-hyaline) more or less into the upper part of 1,

I. 82. Hyarotis.—(*contd.*)

pria, Druce. (35-45). The Banded Flitter. Dawnas to S. Burma. Siam, Tonkin, Malay Peninsular and Islands. VR.

(=*albifascia*, M; *asawa*. Fruh; *inornata*, El; *singularis*, Mab. This seems to be an extremely rare species and I have not seen a ♀, unless a ♀ specimen from Selangor is the true ♀; it has no spot in 1, a completely detached dot in 3 and apical dots in 6 and 8).

4 (3). ♂ unmarked dark brown above and below; ♀ with a hyaline white discal band consisting of large conjoined spot in 2 and cell, usually a conjoined or semi-conjoined spot base 3 and sometimes a conjoined non-hyaline spot in the upper part of 1.

* *monteithii*, WM. (35-40). The Dubious Flitter. Cachar, Dawnas, Malay Peninsular and Islands. Philippines. ? Moluccas (Holland). VR. (=*noctis*, Stg.; *comopoloea*, Swin.; *dissimilis*, Snell.; *perfusca*, Mab.).

I. 83. Itys. The Brush Flitters. (Plate 31.)

1 (2). Upf with small pale yellow hyaline spots, narrow spot across cell constricted in middle or divided in two, quadrate to nearly vertical linear spot in 2, small spot in 3 and apical in 6-7 or 8. Unf dorsum pale, diffused white discal spot in 1; apex F and all H dark purple washed in fresh specimens; unh bearing a very obscure dark central and postdiscal broad band, small yellow spots in 2, 3, 4 and end cell, one or more of which may be absent.

* *microstictum*, WM. (34-39). The Brush Flitter. Cachar, Dawnas, Malay Peninsular (Pulo Ubin). Luzon, Mindoro. VR. (=*binghami*, Swin and *biseriata*, Elwes).

2 (1). Above unmarked dark brown with a faint purple tinge, more prominent below. Uph costa and unh dorsum paler. ♀ paler and larger.

iadera, DeN. (32-36). The Dark Brush Flitter. Penang, Sumatra, Java and Borneo. VR. (=*ciliata*, Elwes).

I. 84. Zographetus. The Flitters. (Plate 31.)

Above dark brown with hyaline white spots on F; 2 cell spots (upper small and often absent), quadrate spot in 2 immediately under the cell spot, small spot in 3, apical 6 and sometimes 7, small non-hyaline spot in 1 in ♀ and ♂ of *satwa* against v1. Cilia greyish.

1 (2). Below basal half costa F and basal ⅜ H bright yellow, outer ⅝ H and apex F purple brown, paling outwardly. Unh small dark spot mid cell and mid 7.

* *satwa*, DeN. (30-36). The purple and Gold Flitter. Kumaon to Burma, Siam, Malay Peninsular, Sumatra and Java. NR. (*durga*, Plotz from Mindanao and Sumbawa is a race or allied species; it has a purple gloss, antennæ white below club and no glandular streaks in ♂).

2 (1). Unf costa and apex and all unh ferruginous to ochreous (paler in ♀), bearing unh a more or less prominent discal row of purple brown spots in 1-7, a spot mid 7 and mid cell. Antennæ white banded before apiculus in ♀.

α. Extremely variable in size, colour of underside, and spots unh, which are usually large and diffused, but may be separate and sharply defined, often upper discal spots absent.

* *ogygia ogygia*, Hew. (30-32). The Purple spotted Flitter. S. India. Sikkim to Burma, Malay Peninsular and Islands. R (= *flavipennis*, DeN.; *flavalum*, DeN; *ogygioides*, Elwes).

β. Unh dark yellow of a peculiar shade; lower discal spots coalesced to a very broad dark band, connected by dark veins to a broad dark marginal area.

ogygia andamana, **nov.** Andamans. R.

I. 85. Isma. The Tufted Flitters. (Plate 31.)

Above dark brown with pale yellow detached spots upf; 2 spots in cell lower elongate, spot in 2 outwardly concave, small spot in 3, may be dot in 4 and apical in 6 and sometimes 7; ♀ may have a non-hyaline spot in 1 against v1. Unf dorsum white. Unh a more or less obscure discal row of dark spots in 1-6 and a spot end cell. Cilia dark brown at tornus H in ♂ and at apex F, elsewhere the long hairs grey or pale yellow.

85. Isma.—(*contd.*)

1 (2). Comparatively small. Below dull dark brown, apex and costa F and all H more or less sparsely overlaid ochreous green scales.

protoclea, HS. (30–34). The Plain Tufted Lancer. Karens to S. Burma, Malay Peninsular, Java, Borneo, Banguey, Borneo, Pulo Laut. R. (=*iapis*, DeN. and *obscura*, Dist.).

2 (1). Comparatively large. Below purple brown.

α. Below purple brown, the outer $\frac{1}{5}$ F and lower $\frac{3}{4}$ H greyish white, all H with a conspicuous purple gloss.

* *vulso bicolor*, **nov.** (38–40). The Purple Tufted Lancer. Karens and Dawnas, Malay Peninsular. R.

β. Below purple brown, overlaid ochreous scales, no purple wash, the dark spots unh in 2 and 3 may be white centred. Upf hyaline spot in 2 more quadrate.

vulso vulso, Mab. Sumatra, Java and Bali. R.

γ. Below with a feeble purple gloss on basal half H, otherwise rather as *protoclea*. The clasp of the genitalia is serrate on the upper edge, not plain as in rest.

vulso purpurascens, El. Borneo, Pulo Laut. (=*binotatus*, El.).

(*sewa*, Plotz from the Celebes probably belongs to this genus).

I. 86. Sepa. The Lancers.

1a (4a. 6a). ♂ with only a discal brand from mid v1 upf to base 3.

1 (2a). ♂ cilia at tornus H elongated as in *Isma* ; brand upf angled at v2. ♂ upf no spot in 1 or in cell ; a very narrow oblique linear pale yellow spot in 2, small spot in 3, may be a dot in 4, small spot in 6 and sometimes in 7. Below paler, but not overlaid ochreous scales, outer half of 1 pale ; unh a small pale spot in 2 and indications of a spot in 4 end cell. ♀ paler, spots on F wider, may be 2 spots in cell ; unf space 1 all dark. Cilia in ♂ dark ochreous, brown at tornus, dark brown in ♀.

cronus, DeN. (42–44). The Branded and Tufted Lancer. Malay Peninsular (Perak and Gunong Ijan), Sumatra and Borneo. VR.

2a (1). ♂ cilia at tornus not prolonged. ♂ brand upf not angled. ♂ upf nearly always a spot in 1, rhomboidal spot in 2, decreasing spots in 3 and 4, small spots in 6 and 7 and may be a dot in 8, 2 elongate spots in cell, lower linear ; all spots white or very pale yellow. Uph cuneate hyaline spots in 2, 3 and 4. Below overlaid ochreous scales. Cilia ashy ochreous.

2 (3). ♂ upf spot in 1 rounded, not reaching v2. Below darker, spots equal, no spot in cell or in 1 and 5. ♀ spots in cell reduced or absent ; uph spots small, round, spot in 4 may be absent.

feralia, Hew. (40–44). The Cicatrose Lancer. Peninsular Siam, Malay Peninsular, Sumatra, Java, Borneo, Pulo Laut. VR. (=*cicatrosa* and *umbrosa*, El. ; *indistincta*, Druce. The synonymy is doubtful ; all the species in the genus are very rare and it is very difficult to link the sexes).

3 (2). ♂ upf spot in 1 narrow, vertical, reaching v1 and may be divided by a black line. Below more ochreous ; unh spots larger may be a spot in cell and often small spots adjoining the spots in 2 and 4 may show above. ♀ spots reduced.

fenestrata, El. (36–39). The Fenestrate Lancer. S. Mergui, Malay Peninsular, Sumatra, Borneo, Pulo Laut. (=*concinna*, El.). VR.

4a (1a. 6a). ♂ with curved linear stigma behind the spot in 2 upf and an oval patch above basal $\frac{1}{4}$ of v1.

4 (5). Upf spots white, large, arranged as in *feralia*, cell spots often conjoined. Uph ♂ very small discal spots in a curve in 2, 3 and usually 4 ; ♀ unmarked.

dawna, **nov.** (38). The Dawna Lancer. Dawnas to S. Burma. VR.

5 (4). Upf spots yellow, arranged much as *feralia*, but very variable F and H. ♂ stigma may be absent.

miosticta, DeN. (42–44). The Cinnamon Lancer. Malay Peninsular, Java, Borneo. VR. (=*guttulifera* and *cinnamonea*, El.).

6a (1a. 4a). ♂ upf no seam, but with an oval patch above basal $\frac{1}{4}$ of v1 ; spot in 2 is differently placed due to the absence of the seam, its inner edge in line with the inner edges of the cell spots ; spots yellow. Unh obscure series of black discal spots in 1–5. ♀ spots reduced and cell spots usually absent,

I. 86. Sepa.—(*contd.*)

6 (7). Uph spots in 2–4 cuneate, prominent, those in 2 and 3 inwardly pointed and reaching bases 2 and 3 ; may be spot in cell and unh in 5.

inarime, DeN. (36–38). The Cuneate Lancer. Mergui, Malay Peninsula, Sumatra, Java, Borneo, Pulo Laut, Phillippines. R. (=*zetus*, Mab. ; *matanga*, Druce ; *bipunctata*, El).

7 (6). Uph spots in 2, 3 and 4 small rounded, latter often absent. Smaller.

bononia, Hew. (26–32). The Baby Lancer. Karens to S. Burma, Malay Peninsula, Sumatra, Java, Borneo, Pulo Laut. R. (= *idyalis*, DeN).

I. 87. Plastingia. The Lancers. (Plate 32.)

Above with prominent yellow or white spots (hyaline) upf ; more or less developed pale basal and costal streak F and discal area H, ochreous or greenish.

1a (6a). F v2 origin much nearer base than the origin of v11 ; v5 bent down at origin. Upf always a hyaline spot in 4. Above markings and cilia bright yellow.

Callineura Group.

1b (5). Unh with purple white spots.

1c (4). Antennæ at least with the entire club yellow.

1 (2a). Uph tornus broadly yellow.

vermiculata, Hew. (40). The Vermiculate Lancer. Sumatra. VR.

2a (1). Uph tornus dark brown.

2 (3). Unf no purple white streak in 5.

α. Unh veins red. Upf cell spots one above the other, lower hardly produced towards base. Antennæ shaft yellow in ♂, club only in ♀.

callineura burmana, **nov.** (39–42). The Red-Vein Lancer. Cachar to S. Burma. R.

β. Unh veins yellow. Upf lower cell spot prolonged towards base and conjoined to spot in 2. Antennæ as last.

callineura perakana, **nov.** Malay Peninsular (Perak, Negri Sembilan, Pahang). R.

γ. Unh and apex unf with red veins. Upf cell spot as in last. Antennæ in ♂ and ♀ with the club only yellow.

callineura callineura, Fd. Sumatra, Java, Borneo.

3 (2). Unf with a purple white streak in 5. Unh veins yellow. Antennæ shaft yellow.

α. Upf cell spots conjoined or nearly so.

latoia margherita, Doh. (36–40). The Yellow-vein Lancer. Upper Assam (Doh). Tenasserim (1♂ B.M.) VR.

β. Upf cell spots separate, lower nearer base.

* *latoia latoia*, Hew. Dawnas to S. Burma. Siam, Malay Peninsula, Sumatra, Java, Borneo and Labuan, Philippines. R.

4 (1c). Antennæ with only the apiculus yellow. Above like *latoia*, but smaller. Unh mostly yellow. Very variable.

α. Upf basal yellow area restricted.

helena fruhstorferi, Mab. (32). The Small Yellow-vein Lancer. S. Mergui, Malay Peninsula, Sumatra, Java, Batoe Is. R. (= *niasana*, Fruh.).

β. Above basal yellow area upf much more extensive.

helena helena, But. Borneo, Labuan, Pulo Laut. R. (= *natuna*, Fruh. *flavia*, Stg. is the race from the Philippines and ? Celebes).

5 (1b). Unh no purple white spots. Upf the yellow spot in 2 reaches base 2 all the discal spots form a broad continuous band. Unh orange with small black spots.

aurantiaca, El (35–39). The Orange Lancer. Sumatra, Borneo, Pulo Laut. R. (Species allied to the above are *telesinus*, Mab. = *laenas*, Mab. Philippines with unh yellow green bearing feeble pale spots. *liburnia*, Hew., Philippines and Luzon, unh dark brown with prominent yellow spots).

6a (1a). F v2 from mid base and origin v11.

6b (11a). F v5 straight or nearly so. Upf no spot in 4. Unh with markings.

Sala Group.

6c (9a). Unh with a semi-circular row of small black discal spots, a round spot end cell and spots at base 2 and 7. Unf some dark spotting at the apex.

I. 87. Plastingia.—(*contd.*)

6d (8). Uph no prominent yellow area. Upf a rather obscure dark ochreous streak from base to middle over v1. Antennæ white ringed mid club.

6 (7). Antennæ shaft only chequered at extreme base. Upf lower cell spot larger than the upper spot ; apical spots in 6 or 6 and 7 ; hyaline spots pale yellow. Uph in ♂ a recumbent tuft of shining dark brown hairs from base overlying cell. Below apex and costa F and all H dark grey brown with a strong purple wash. Tegumen with ears at the side.

* *sala*, Hew. (32–36). The Purple Lancer. Cachar to S. Burma. Malay Peninsular, Pulo Laut. R. (= *fuscicornis*, El.).

7 (6). Antennæ shaft chequered throughout. Upf lower cell spot no larger than the upper one and may be absent ; no apical spots ; spots white. Uph ♂ no tuft. Tegumen with spines at the side.

α. Below apex and costa F and all H pale yellow brown with a faint purple wash.

submaculata kanara, **nov.** (32–36). The Maculate Lancer. N. Kanara. R.

β. Unh, etc. shining greenish grey.

submaculata maculicornis, El. Ataran Valley, Burma, Siam, Pulo Laut. VR.

γ. Below yellow green.

submaculata submaculata, Stg. Palawan.

8 (6d). Uph with a prominent yellow discal patch and upf with prominent yellow basal streaks. Unh yellow. Uph tornal area brown. Upf cell spots equal.

α. Uph yellow discal area divided by dark veins. Unh spots complete and diffused.

* *noemi noemi*, DeN. (35–40). The Spotted Yellow Lancer. Sikkim to Assam. VR.

β. Uph yellow discal area not divided by black veins. Unh markings mostly consist of narrow rings and may be incomplete.

noemi tavoyana, **nov.** Karens (Doh). Tavoy, Mergui. VR.

(Species allied to *noemi* are *similis*, El., Borneo, Pulo Laut, much smaller. *flavescens*, Fd. = *atala* and *samanga*, Fruh, Celebes, with the tornal area uph broadly yellow, *viburnia*, Semp, Philippines, with unh prominently black veined).

9a (6c). Unh chequered all over with large black and yellow or white pale spots.

9 (10). Below pale spots white in ♂ and ♀. Above yellow markings obscure ; upf lower cell spot small or absent.

* *naga*, DeN. (33–38). The Silver Spotted Lancer. Assam to Burma, Malay Peninsular, Sumatra, Java, Borneo, ? Philippines. (=*valenia*, Fruh.). R.

10 (9). Below spots pale yellow. Above yellow markings prominent ; upf lower cell spot well developed.

tessellata, Hew. (33–40). The Straw spotted Lancer. Malay Peninsular, Sumatra, Java, Borneo, Philippines, Celebes. R. (= *eulepis*, Fd ; *palawata*, Stg. ; *pellonia* and *mangolina*, Fruh.).

11a (6b). F v5 bent down at origin. Unh unmarked.

Corissa Group.

11 (12). Upf no spot in 4. Uph discal yellow area small or absent cilia yellow. Below apex F and all H yellow, veins paler.

α. Above unmarked.

corissa tytleri, Evans. (30). The Plain Yellow Lancer. Nagas. VR.

β. Upf prominent discal yellow spots in 2, 3, apical in 6–7 and 2 cell spots, non-hyaline spot in 1.

* *corissa corissa*, Hew. (30–45). Dawnas to S. Burma, Malay Peninsular, Sumatra, Java, Borneo, Pulo Laut. R. (= *indrasana*. El ; *drancus*, Plotz. ; *latonia*, Stg. ; *patmapana*, Fruh.).

12 (11). Upf with a spot in 4, over the spot in 3, no spot in 1 and basal streak obscure ; spots yellow. Uph plain. Below apex F and all H overlaid dark ochreous scales, unmarked.

pugnans, DeN. (34–36). The Pugnacious Lancer. Dawnas to S. Burma, Malay Peninsular and Islands. R.

(*extrusus*, Fd, Aru is a peculiar species, mimicking *Allora doleschalli*).

I. 88. Lotongus. The Palmers. (Plate 32.)

Above with prominent hyaline spots on F.

1a (3a). Unh no yellow band. Upf spots white.

Calathus Group.

1 (2). Upf hyaline spots large and conjoined, spot in 3 to base 3, non-hyaline yellow spot in 1 against v1, apical spots 6–8 present or absent. Uph costa and apex to v7 whitish yellow. Unf discal spots continued to costa and broadly to dorsum. Unh termen white from apex to mid 3.

* *calathus*, Hew. (44–46). The White Tipped Palmer. Tavoy to S. Burma, Malay Peninsular, Sumatra, Java, Borneo. Palawan. R. (= *zalates*, Mab. and *aliena*, Stg.).

2 (1). Upf hyaline white spots smaller and completely separated. ♂ double (♀ single) spot in cell ; ♂ quadrate (♀ oblique) spot mid 2, small spot in 3, no apical spots and only obscure spot in 1 in ♀ ; spots may be even more reduced. Unf discal band continued to costa and a large white spot in 1 ; unh apex may be yellowish white.

schœdia, Hew. (42–45). The Plain Palmer. Malay Peninsular, Sumatra, Nias and Borneo. R. (= *parthenope*, Weymer ; *traviata*, Plotz ; *surus*, Mab. and *maculatus*, Dist).

(*taprobanus*, Plotz. = *mythecoides*, DeN. is an allied species from the Celebes with a prominent white band unh).

3a (1a). Unh with a conspicuous yellow band.

Avesta Group.

3 (4a). Uph tornus and dorsum yellow joining a broad central yellow area ; unh central yellow band very broad, from v1 to costa, parallel to termen. Upf double white spot in cell, spot mid 2 and a spot in 3 against its outer edge, apical spots in 6–8. Unf apex paler, cell spot joined to costa by a yellow area. Antennæ club white below. Resembles *Hasora schonherri*.

onara, But. (42–44). The Yellow Palmer. Sumatra, Borneo, Palawan. VR. (= *excellens*, Stg. and *adorabilis*, Fruh.).

4a (3). Uph dorsum dark brown. Below chocolate brown, dorsum F much paler ; unf cell spot continued to costa by a yellow spot ; unh a narrow yellow band, from basal ½ dorsum to mid costa, interrupted at v1a. Upf no apical spots.

4 (5). Upf 2 spots in cell, conjoined to a single spot in ♀ ; large spot in 2, prolonged in ♀ under cell spot, prominent spot in 3, non-hyaline spot in 1. Uph tornal cilia yellow and central area from v1–7. Unh band rather broader and expanding to costa, slightly curved. H excavated at v1 and lobed. Below purple washed and veins pale. Hyaline spots white.

sarala, DeN. (45–50). The Yellowband Palmer. Assam to Bhamo, Tonkin, W. China. VR.

5 (4). Upf only rounded pale yellow spots in 2 and 3. Uph unmarked and cilia uniform dark brown. Unf an upper spot in cell. Unh band narrow and straight, nearer base. Below chocolate brown, no purple wash and veins not pale. H termen even.

avesta, Hew. (44–48). The Malay Yellowband Palmer. Dawnas to S. Burma, Borneo, Pulo Laut. VR. (= *tamiata*, Stg. *quinquepuncta*, Joicey and Talbot is a well marked race from Hainan).

(*To be continued*)

ON SOME INTERESTING FEATURES OF THE FAUNA OF THE WESTERN GHATS

BY

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[Read at the thirteenth annual meeting of the Indian Science Congress at Bombay and communicated with the permission of the Director, Zoological Survey of India.]

The nearness of the Western Ghats to the place of our meeting this year and the charming peculiarities of its fauna have induced me to write this short note. It is written chiefly with the object of exciting some interest in the study of Natural History among the advanced students of zoology of the Bombay University. There are two striking peculiarities of the fauna of the Western Ghats, firstly the presence of a marine element in the fauna, and secondly the wonderful adaptations exhibited by several animals to the extremely wet and dry weather conditions that prevail at different times of the year in the Ghats. I shall illustrate my point by referring to four definite instances, which of late have attracted great attention and about which more information is badly needed. I want to refer to *Succinea arboricola* Rao, *Cremnoconchus syhadrensis* Blanford, *Lithotis rupicola* Blanford and *Limnocnida indica* Annandale. Besides these I shall have occasion to refer to several other interesting forms found in this area.

A very interesting mollusc, *Succinea arboricola* Rao,[1] was recently discovered by me aestivating on the bark of mango trees at Lonavla. A short note [2] on its habits was read at the last meeting of the Congress and has since then been published in the *Records of the Indian Museum*.[3] Several of the specimens collected during August and September, 1924, are still with me aestivating on the bark, and I have not been able to find out at what time of the year they become active. In the midst of heavy rains I found *S. arboricola* in deep slumber, and in the last week of December last year I found them in a similar comatose condition. The only changes that have been observed are that the number of individuals found in December is much less and that the mollusc, instead of being found on the bark, was found aestivating on scars left by the falling of leaves from small twigs. This observation leads to the conclusion that the animals had been leading an active life for some time during the months intervening between September and December. It would be extremely interesting to make fortnightly observations on these molluscs with a view to studying their behaviour under natural conditions from season to season, and to work out their entire life-history.

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[1] Rao, *Rec. Ind. Mus.*, xxvii, pp. 394–400 (1925).
[2] Hora, *Proc. Twelfth Ind. Sci. Cong.*, p. 148 (1925).
[3] Hora, *Rec. Ind. Mus.*, xxvii, pp. 401–403 (1925).

Cremnoconchus syhadrensis Blanford[1] is another peculiar mollusc of an essentially marine family—*Littorinidæ*—found on rocks below the falls at Khandhalla. The species seems to possess a very localised distribution, for last year when I was specially looking for them, I did not find a single specimen anywhere between Bombay and Mahabaleshwar except below the two big falls near Khandhalla. During the rains the falls are not quite accessible, but at other times of the year it takes from twenty to thirty minutes to reach them from the station with a suitable guide. Towards the end of December, after a very careful and long search, only two individuals of *Cremnoconchus syhadrensis* were found by me on the rocks kept moist by spray of water from the fall. They were, however, quite plentiful on big rocks projecting out of the water at the edge of the pool in the neighbourhood of the fall. They were found aestivating in small pits well protected from the midday sun. Drs. Annandale[2] and Prashad [3] have already referred to the peculiar mode of life of this species.

In the Nilgiris there is another mollusc of the family *Neritidae* which possesses more or less similar habits to those of *Cremnoconchus*. *Neritina perott etiana* Recluz[4] is found on rocks kept moist by spray from a fall or on the edges of streamlets where they are occasionally washed by the current of water. The Nilgiris, unlike the portion of the Western Ghats in the immediate neighbourhood of Bombay, are never extremely dry, because they get heavy rainfalls during both the monsoons. In accordance with the climatic conditions prevailing in the Nilgiris *Neritina perottetiana* is probably not called upon to hibernate in the dry season as does *Cremnoconchus syhadrensis,* and it was found that the animals of the former species died a few hours after they were removed from their natural habitat, while those of the latter are capable of surviving long periods of dessication.

Lithotis rupicola Blanford[5] is another highly peculiar mollusc of a very limited range. It was first described by Blanford from the edge of the waterfall at Khandhalla in 1863, but since then it has remained in obscurity. Very little was hitherto known regarding its habits and anatomy. From the material collected by me in 1924, Dr. H. S. Rao[6] has been able to confirm its distinct position in the family *Succineidae*. *Lithotis rupicola* was found in great abundance along with *Cremnoconchus* during rains, but we know very little about its mode of life after the rainy season. The late Dr. Annandale,[7] who visited the locality in March and April, records the entire absence of this mollusc from the cliffs below the Khandhalla falls. In December last year I made a thorough search for it but with no success. Not even a single dry shell of the species was seen on the spot. The Succineid molluscs are known to hibernate on rocks, trees, etc., during the unfavourable season, but the exact conditions under which *Lithotis rupicola* passes the dry season still remains to be investigated. Another species of *Lithotis*, *L. tumida* Blanford,[1] known from Poona and the adjoining country, has not been found again since its discovery in 1870, and we know very little either about the structure of its animal or its habits.

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[1] Blanford, *Ann. Mag. Nat. Hist.* (3), xii, p. 184, Pl. IV. (1863).

[2] Annandale, *Rec. Ind. Mus.*, xvi, pp. 119, 148 (1919).

[3] Prashad, *Proc. Twelfth Ind. Sci. Cong.*, pp. 138, 139 (1925).

[4] Recluz, Rev. *Zool. Cuv.*, p. 333 (1841).

[5] Blanford, *Ann. Mag. Nat. Hist.* (3) XII, p. 186, Pl. IV, figs. 8–10 (1863).

[6] Rao, *Rec. Ind. Mus.*, xxvii, pp. 387–394 (1925).

[7] Annandale, *Rec. Ind. Mus.*, xvi, p. 119 (1919).

I should also like to mention here a small species of *Paludomus*[2] and a highly modified, air-breathing Ampullarid—*Turbinicola saxea* Reeve[3]—which are abundant during the rainy season all over the Ghats from Khandhalla to Mahabaleshwar. Very few specimens were seen of the latter species in December, and to work out the entire life history of these two fairly common molluscs will be a nice piece of work.

In the Ghats in 1911, Prof. Agharkar discovered a widely distributed freshwater medusa, and realising the significance of such a discovery, Annandale sent a short note to *Nature* and to the *Proceedings of the Asiatic Society of Bengal.*[4] Next year when he examined better preserved material, he[5] christened the medusa *Limnocnida indica.* In the same year a note on its habits and distribution was published by Gravely and Agharkar.[6] In 1913 Agharkar[7] published a further note on the species. The medusae have so far been collected from the Krishna river at Dhom, Yenna river at Medha, and the Koyna river at Tambi. I was informed by an old fisherman at Wai that these 'flowers' were also to be found in a big tank adjoining the bridge near Wai, and there is no apparent reason why these medusae should not be found all over the valleys of these rivers in suitable places. Several attempts have been made to find the asexual phase of this medusa or the hydroid stage, but so far without any success. The medusae appear in March and April and disappear suddenly with the first showers of the monsoon rains. The best way to find its hydroid stage is to pay occasional visits to these places from February to May and to look carefully for the growth on the rocks, or to try to breed the medusae under more or less natural conditions.

Besides the peculiarly modified individuals mentioned above, there is a great variety of interesting animals found in the Ghats and the report published by the late Dr. N. Annandale on the fauna of certain small streams in the Bombay Presidency, shows the wealth of material that is to be found in this area and the fascinating characters of its fauna.

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[1] Blanford, *Journ. As. Soc. Bengal*, xxxix, p. 23, Pl. 3, Fig. 24 (1870).

[2] Annandale, *Rec. Ind. Mus.*, xvi, p. 147 (1919).

[3] Prashad, *Mem. Ind. Mus.* viii, pp. 87, 88 (1925).

[4] Annandale, *Proc. As. Soc. Bengal*, for May, 1911, also Annandale, *Nature*, xxxiii, p. 144 (1911).

[5] Annandale, *Rec. Ind. Mus.*, vii, pp. 253-256 (1912).

[6] Gravely and Agharkar, *Rec. Ind. Mus.*, vii, pp. 399-403 (1912).

[7] Agharkar, *Rec. Ind. Mus.*, ix, pp. 247-249 (1913).

RECENT ADDITIONS TO THE INDO-CEYLONESE *COCCID* FAUNA, WITH NOTES ON KNOWN AND NEW FORMS

BY

T. V. RAMAKRISHNA AIYAR

In 1921 the writer prepared a check list of the Indo-Ceylonese Coccidæ then known and the same was published in the Report of the Proceedings of the Fourth Entomological Meeting at Pusa the same year. Since then, a few additional papers[1] have appeared containing new records and further data on known forms. Of these the most important is Green's fifth volume on Ceylon Coccidæ. This extremely valuable addition to the literature on Asiatic Coccidæ from one of the foremost authorities on the group not only contains new records from Ceylon but includes a wealth of information on the whole family, especially with regard to the taxonomy and nomenclature of the various sub groups and species. With the idea of making the writer's list of 1921 more complete and up-to-date for purposes of reference, this paper is prepared as a supplement to the same. All new forms recorded from the region since the publication of the list of 1921 and a few that were omitted from that list by oversight are included here with such notes on known forms which appeared to the writer to be worth recording. In addition, the more important changes in taxonomy and nomenclature, especially those pointed out by Mr. Green, are also indicated. It is believed that the original list with this supplement may be of some use to Indian workers on this group until such time when a complete annotated catalogue of the family with all up-to-date data can be prepared.

NOTE.—Those forms with an asterisck in the following list are species which have been referred to in the previous list ; others are new records noted since then. All new forms with manuscript names were collected by the writer, and were very kindly identified by Mr. Green. This supplementary list was also perused by Mr. Green and the necessary amendments made. and the writer hereby expresses his thanks for the continued help he has been getting in this manner.

Sub-Family.—MONOPHLEBINÆ.

Monophlebus, Burm.

M. phyllanthi, Green. p. 169. A. M. N. H. xii. 1923. This new species was confused with *M. contrahens* Wlk. and was identified as such by Green in his recently published fifth part of Ceylon Coccidæ. He has since found out the mistake and described it as *phyllanthi* in the above reference. Material of *phyllanthi* has been collected by the writer from Malabar and Godavari on *Cleistanthus and Croton*[2] respectively.

Icerya, Sign.

I. purchasi, Maskell. This pest which appears to be a recent introduction into Ceylon was omitted in the 1921 list ; not noted in India as yet ; p. 221, N. Z. Trans., xi, 1878 and p. 436, Green, C. of C. V. 1922. Found in Ceylon on *Acacia*, sp. *Casuarina*, *Citrus*.

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[1] 1. Green, ' Coccidæ of Ceylon ' Pt. v, 1922. Dulau & Co., London.
2. Green ' Supplementary notes on the Coccidæ of Ceylon ', *Bombay Natural History Journal*, vol. xxviii. 1922, pp. 1007–1037.
3. Ramakrishna Aiyar, ' A Further Contribution to our Knowledge of South Indian Coccidæ,' Report of the 5th Ent. Meeting, Pusa, 1923, pp. 339–344.
4. Misra, 'A List of Coccidæ in the Pusa Collection ' 5th Ent. Meeting, Pusa pp. 345–350, 1923.
5. Green, On Monophlebus Contrahens W, and a new sp p, 168, A, M. N H., xii. 1923.

[2] Referred as *M. tamarindus* in previous list,

I. aegyptiaca, Douglas.* (1890) = I. *Tangalla*, Green (1896) *vide* Green, p. 439 of C. of C. V., 1922.

I. seychellarum, West.* (1855) = I. *Crocea*, Green (1896) *vide* Green, p. 440. C. of C. V., 1922.

I. seychellarum, var *nardi* Green. p. 441, C. of C. V., 1922 on *Andropogon nardus*. Diyatalawa (Ceylon).

Leachia festiva, Kief. Kieffer records this species on mango-Bengal on p. 163. Marcellia. xii. 1908.

I. jacobsoni, *Green*. p. 316. Tijdschrift V., Ent. lv. 1912 on Shorea Bangolore. (M. Hassan Coll.)

Walkeriana, Sign.

W. ovilla, Green. p. 448, C. of C. V., 1922, on *Eugenia subavenis and Michelia nilagirica*, Hekgala, Ceylon.

Aspidoproctus, Newstead.

Walkeriana cinerea,* Green (*a*) and *W. euphorbiæ*, Green.* (*a*) are brought under the genus *Aspidoproctus*. Green, pp. 450 and 453, C. of C. V., 1922.

Labioproctus, Green.

Walkeriana polei, Green. 1896, is brought by Green under this newly erected genus *Labioproctus*. p. 453, C. of. C. V., 1922.

Nietnera, Green.

N. pundaluoya, Green 455 C. of C. V. 1922 ; on *Litsea*, on cinnamomum, etc., different places in Ceylon.

Sub-Family.—MARGARODINÆ

Kuwania Ckll.

Monophlebus zeylanicus, Green* (1896) is brought under the above genus, Green, p. 425 C. of C. V., 1922.

The Species is thought to be nearer the Margarodinæ.

Sub-Family—TACHARDINÆ

Chamberlin has recently revised the taxonomy of this group. He erects it into a family called Lacciferidæ. According to him the Indo-Ceylonese species are arranged as under, *vide* Bulletin. Ent. Res. xvi. 1925.

Laccifer, Oken

L. albizziæ, Green
L. fici, Green
L. lacca, Kerr
p. 340, Ramakrishna Aiyar. Check list of Coccidæ, 1921.

L. ebrachiata, Chamberlin. On *Ficus*, Bangalore. *Vide* above reference.

Metacardia, Chamberlin

M. conchiferata, Green, p. 407. *Coccidæ of Ceylon*, vol. v, 1922. On *Mimosa*, *Anona*, croton—Kandy, Jaffna Matale, Ceylon.

Tachardina, Chamberlin

T. decorella, Maskell
T. theæ, Green
p. 340, Ramakrishna Ayyar's list of 1921.

T. lobata, Green, p. 414, C. of C.V., 1922 and p. 340 of Ramakrishna Ayyar's list of 1921. On *Flacourtia* and *Fluggea* in Ceylon and on *Thespesea* and *Pongamia* in S. India. See also p. 208. Bull. Ent. Res. xiv. 1923.

T. ternata, Chamberlin. Included as doubtful species are Mahdihassan's, *silvestrii*, *pagoliensis*, *sindica mysorenis*, *communis*, *and chinensis*.

T. minuta, Mor, does not occur in India.

Sub-Family—ERIOCOCCUS

Eriococcinæ

The genus *Kermes* Boit is brought under the above sub-family by Green p 345, C. of C.V., 1922.

Eriococcus, Targ.

E. nueræ, Green, p. 349, C. of C.V., 1922. On unknown tree, Nuwara Eliya.
E. bambusæ, Green, p. 350, C. of C.V., 1922. On bamboo, Udagama.
E. transversus, Green, p. 351, C. of C.V., 1922. On *Arundinaria*, Maskeliya.
E. tenius, Green, p. 351, C. of C.V., 1922. On Grass. Pundaluoya.
E. rhodomyrti, Green, p. 352. C. of C.V., 1922. On *Rhodomyrtus*, Nuwara Eliya.
E. osbeckiæ, Green, p. 353,C. of C.V., 1922. On *osbeckia*, Namunakuli.

Pseudopulvinaria, Atk.

Lefroyia castenea, Green (1908) * = *Pseudopulvinaria sikkimensis*, Atk, (1889) * and is brought under *Eriococcinæ*, Green, p. 345, C. of C.V., 1922.

Sub-Family—ASTEROLECANIINÆ

Asterlolecanium, Targ.

A. minutum, Green (*Ms.*) On bamboo, Dhony, Malabar.
A. gutta, Green, p. 1035, B.J., xxviii. 1922. On *Calophyllum walkeri*. Pattipola, Ceylon.
A. loranthi, Green, p. 1036. Do. do. On Loranthus. Hakgala, Ceylon.
A. pseudomiliaris, Green, p. 1036, B.J., xxviii. 1922. On Bamboo. Peradeniya, Ceylon.
A. lineare, Green, is renamed *A. lanceolatum* by Green p. 461, C. of C.V., 1922 as the former name appears to be preoccupied.

Polea, Green

This new genus is erected for Green's *Pollinia ceylonica* * (1909), p. 461, C. of C.V., 1922.

Cerococcus, Comst.

Eriococcus paradoxa, Msk., var *indica* Green = *Cerococcus indicus*, Green, these two are inserted separtely in the previous list by mistake.

Anomalococcus, Green.

A. hirsutus, Green: (*Ms.*) On a wild tree. Sengleteri, Tinnevelly.

A. cremastogastri, Green. This is given in the Pusa list [1] as from Coimbatore. This identification appears doubtful as our species is not *cremastogastri* but *indicus* Green. (*Ms.*)

Sub-Family—*Dactylopiinæ*

Halimococcus, Ckll.

H. borassi Green, p. 360. C. of C. V., 1922. On palmyra fronds, Peradeniya.

Geococcus, Green.

G. radicum, Green, p. 262. E.M.M., vol. 38. 1902 also p. 361, C. of C. V., 1922, on grass roots. Pundaluoya.

Pseudantonina, Green.

P. bambusæ, Green, p. 363, C. of C. V., 1922. On bamboo. Nuwara Eliya.

Pedronia, Green

P. strobilanthis, Green, p. 364, C. of C. V., 1922. On Strobilanthus. Nuwara Eliya.

Erioides, Green.

E. cuneiformis, Green, p. 365, C. of C. V., 1922. On *Eugenia oligantha* and *Calophyllum*, Nuwara Eliya.

E. rimulæ, Green, 366, do. do. *Phyllanthus* bark and *Eugnymus* sp.; Nuwara Eliya

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[1] p. 346. Rpt. of 5 Ent. Meeting, Pusa, 1923.

Tylococcus, Newstead.

T. formicarii, Green, p. 368, C. of C. V., 1922. From nests of *Cremastogaster* on *Grewia*. Maha Illuppalama, Ceylon.

T. simplicior, Green, p. 369, C. of C. V., 1922, on unknown plants with the ant *Œcophylla*, Maha Illuppalama, Ceylon.

[Note :—Both the above species are now referred to the genus *Farinococcus* of Morrison].

Pseudococcus, West.

P. kandyensis, Green, p. 373, C. of C. V., 1922. On grass. Kandy.
P. pulverarius, Newst, p. 373. Do. do. do. Pundaluoya.
P. pulverarius, sub sp. *bambusæ*, Green, p. 374, C. of C. V., 1922. On bamboo. Pundaluoya.
P. citriculus, Green, p. 377, C. of C. V., 1922. On leaves of *Citrus*. Peradeniya.
P. monticola, Green, p. 378. Do. do. On elephant grass, Maskeliya.
P. corymbatus, Green, (*Ms.*) and *P. nipæ*, Green, on Casuarina, potato, etc. are = *P. filamentosus*, Ckll. var *corymbatus*, Green, *vide* p. 379, C. of C. V., 1922.
P. crotonis, Green,[1] = *P. lilacinus*, Ckll, Green, p. 380, C. of C. V., 1922.
P. maritimus, Erhorn, p. 315, Canad. Ent., 1900, and Green, p. 384, C. of C. V., 1922. On *Passiflora* and Tomato. Pundaluoya.
P. comstocki, Kuwana, p. 52. Proc. of Cal. Ac. Sc., iii, 1902. Green, p. 386. C. of C. V., 1922, on *Loranthus*, Pundaluoya.
P. debregeasiæ, Green, p. 388, C. of C. V., 1922. On *Debregeasia*, Pundaluoya.
P. detorquens, Green (*Ms.*) On bamboo, shoots, Walayar, Malabar.

Ferisia, Fullaway.

Pseudococcus virgatus, Ckll. is brought under this new genus by Fullaway, p. 311, Proc. Haw. Ent. Soc., v. 1923.

Phenacoccus, Ckll.

P. glomeratus, Green, p. 389, C. of C. V., 1922. On *Hibisuus esculentus* and *Thespesia*. Peradeniya.
P. ornatus,[2] Green, p. 392, C. of C. V., 1922. On *Jasminum sp*. Ceylon. Also recorded by the writer on Jasmine from S. India.
P. spinosus, Robinson, p. 145, Philip. Jour. Sc. xii, 1918 and p. 394. Green, C. of C. V., 1922, on *Ficus*, Peradeniya.
P. hirsutus, Green. Has been recently noted in S. India on *Ficus sp*. and in shoots of teak ; rather badly on the latter—Walayar.
P. ballardi, Newst.=*P. mangiferae*, Green.

Antonina, Sign.

A. maritima,[3] Green, p. 396, C. of C. V., 1922. On *Cyperus*, Colombo.
A. bambusæ, Msk., p. 237, N. Z. Tr., xxv, 1892 and Green, p. 397, C. of C. V., 1922. On Bamboo. Peradeniya, also found in S. India. Nilgiris. (E. E. Green Coll.)

Lachnodius, Msk.

L. humboldtiæ, Green, p. 400. C. of C. V., 1922. on *Humboldtia*, Yatiyantota, Ceylon. This species is to come under *Lachnodiella*, Hemp, according to Morrison.

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[1] p. 46, Proc. M. S. Nat. Mus., vol. 60, 1922.

[2] pp. 41 and 45. A contribution to our knowledge of S. Indian Coccidæ by T. V. Ramakrishna Ayyar, published as Bull. No. 87 of the Pusa Agrl. Res. Inst., 1919.

[3] pp. 41 and 45. A contribution to knowledge of S. Indian Coccidæ by T. V. Ramakrishna Ayyar, published as. Bull, No. 87 of the Pusa Agrl. Res. Inst., 1919.

Xenococcus, Silvestri.

X. annandalei, Silvestri, p. 311, Rec. Ind. Mus., xxvi, 1924; in nest of ant (*Acropyga acutiventris*) in roots of *Ficus, sp.*, Madras.

Sub-Family—LECANIINÆ

Aclerda, Sign.

A. japonica, Newst. This has recently been noted on sugarcane in Salem, S. India.

A. ischœmi, Green, (*Ms.*) On *Ischæmum hirsutum*, Sengleteri, S. India.

Cribrolecanium, Green.

C. formicarium, Green, p. 639, A. M. N. H., viii, 1921. On *Stereospermum* branches with ant. *Cremastogaster* sp. Ceylon.

C. radicicola, Green, p. 642, A.M.N.H., viii, 1921. On roots of *Acacia auriculiformis*, Coimbatore. The food plant given as *Cassia* was the writer's mistake.

Lecanium, Burn.

L. mangiferæ, Green.* On mango, Coimbatore. The first record for Continental India.

L. bicruciatum, Green.* On mango, Tinnevelly. First record for Continental India.

L. desolatum, Green, p. 1020, B.J., xxviii, 1922. On *Ficus gibbosa*. Peradeniya.

L. fusiforme, Green, do. do. On unknown plant. Ambalangoda.

L. illuppalamæ, Green, p. 1021, B.J., xxviii, 1922. On unknown plant. Mahaiillupalama.

L. ixoræ, Green, p. 1022, do. do. On *Ixora Coccinæ*. Henaratgoda.

L. latioperculatum, Green, p. 1022, do. do. On a wild shrub. Peradeniya. Recently noted by the writer on mango in Coimbatore, S. India.

L. limbatum, Green, p. 1023, B.J., xxviii, 1922. On *Ixora coccinea*, Baticaloa, Ceylon.

L. mancum, Green, p 1023. On *Calophyllum*. Badulla, Ceylon.

L. piperis var *namunakuli*, Green, p. 1024, B.J., xxviii 1922. On *piperis.* sp. Badulla, Ceylon.

L. tesselatum var obsoletum, Green, p. 1024. On *Myrtus*. Matale.

L. tessalatum,* noted on palm in hot house. Nilgiris.

L. trifasciatum, Green, p. 1024, B.J., xxviii, 1922. On *Hemicyclea*. Baticaloa.

L. tripartitum, Green, p. 1025, do do. On *Calophyllum* Badulla.

L. ramakrishnæ, Green, (Ms.) noted on pear. Kulu, N. India, *vide* Pusa list.

L. marsupiale, Green,* noted pretty bad on *Ficus indicus*, Kollegal. S. India.

L. imbricans and *Hemilecanium imbricans*,* Green, are same and not different as would appear from Pusa list.

Lecanopsis, Targ.

L. ceylonica, Green, p. 1026, B.J., xxviii, 1922. Pattipola. Ceylon.

Exaeretopus, Newst.

E. farinosus, Green, p. 1027, B.J., xxviii, 1922. On *Psychotria bisulcata*, Badulla.

Ceronema, Msk.

C. fryeri, Green, p. 1028, B.J., xxviii, 1922. On unknown plant, Maha Illuppalama.

C. iceryoides, Green, p. 1029, do. do. do. Puttalam.

Ctenochiton, Msk.

C. cinnamomi, Green, p. 1030, B.J., xxviii, 1922. On *Cinnamomum*. Colombo.
C. fryeri, Green, p. 1031, do. do. On unknown tree. Vavuniya, Ceylon.
C. olivaceum, Green p. 1032, do. do. On *Pterospermum suberifolium*. Matale, Ceylon.

Cardiococcus, Ckll.

Inglisia bivalata, Green and *I. castilloa*, Green, are brought under this genus, *vide* Green, p. 1034, B.J., xxviii, 1922 ; the former was recently found badly infesting *Pongamia glabra* shoots in Coimbatore, S. India.

Lecaniodiaspis, Targ.

L. mimusopis, Green, p. 1034, B.J., xxviii, 1922. On bark of *Mimusops hexandra*. Hambantota, Ceylon.

Pulvinaria, Targ.

P. polygonata, Ckll. Pusa list, p. 347, Rept. 5th Ent. Meetg. On mang. Pusa.
P. cellulosa, Green, do. do. do. do.
P. maxima, Green, a memoir on—Ramakrishna Aiyar : Pusa. Ent. Mem. 1925 ; Vol. viii (12) pp. 127–155.

Takahashia, Ckll.

T. japonica, Ckll. Pusa list, p. 347, Rept. 5th Ent. Meetg. On Mulberry. Bhimtal, N. India.

Neolecanium, Parr.

N. crustuliforme, Green. This is referred to the genus *Platysaissetia* by Cockerell, *vide* p. 461, Green, C. of C. V. 1922.

Sub-Family—DIASPINÆ

Chionaspis, Sign.

C. gynandropsidis, Green, p. 1017, B.J., xxviii, 1922. On *Gynandropsis*. Peradeniya.
C. acuminata var *atricolor* Green, p. 1017, B.J., xxviii, 1922. On *carissa*. Maha Illuppalama.
C. linearis, Green, p. 1018, B.J., xxviii, 1922. On bamboo leaves. Peradeniya.
C. tenera, Green, p. 1019, do. do. On unknown shrub. Mahaluppalama.
C. pusa, Green, (*Ms.*) Pusa list. p. 348, Rept. of the 5th Ent. Meetg. On orange leaves, Pusa.
C. centripetalis, (*Ms.*) Green, do. do. do. On apple leaves. Kashmir.
C. spp. megaloba, Green, and *Hedyotidis*, Green, are recorded from N. India (Pusa list) from Pusa and Kangra respectively.
C. longissima, Green (*Ms.*) recently noted on bamboo. Dhony, Malabar.
C. elongata, Green,* recently recorded on bamboo. Dhony, Malabar ; first record for India.
C. herbæ, Green.* On grass. (Coonoor, S. India.) Do. record for India.

Hemichionaspis, Ckll.=*Pinnaspis*, Ckll (an earlier name).

P. buxi, Bouche. In Pusa list on *Dracœrna* leaves. Bombay.
P. ramakrishnae, Green. (*Ms.*) on *Eugenia Calophyllifolia*. Coonoor, S. India.
P. bauhiniæ, Green (*Ms.*) On *Bauhinia racemosa* Papanasam, Tinnevelly.

Neoleucaspis, *Nov. gen.* Green (*Ms.*)

N. parallela, Green. (*Ms.*) recently found by the writer on bamboo. Dhony, Malabar.

Diaspis, Costa.

D. barbatus, Green, (*Ms.*) on *Ischæmum hirsutum*. Sengleteri, Tinnevelly.

D. boisduvali, Sign, p. 342. Ann. Soc. Ent. Fr., ix, 1869. Green, p. 464, C. of C. V., 1922, on Orchid, Maskeliya noted in S. India also on Orchid. Ootacamund.

D. antiquorum, Green, p. 1011, B. J., xxviii, 1922, on *Euphorbia antiquorum* with *Parlatoria mangiferæ*. Green. Elephant Pass, Ceylon.

D. bambusæ, Green, p. 1012, B. J., xxviii, 1922. On bambo. Yatiantota, Ceylon.

D. heneratgoda, Green, p. 1012 do. On unknown tree. Heneratgoda.

D. orientalis, Green, p. 1013 do. On *Sapindus*. Sigiriana. Ceylon; recently noted by the writer on *Hemigyrosa*. Tinnevelly, S. India.

D. phœnicis, Green, p. 1014, B.J., xxviii, 1922. On *Phœnix zeylanica*. Mahailluppalma.

D. mihiriya, Green, p. 1014 do. On *Dichopsis*. Bogawantalawa.

D. grandilobis, Green, p. 1015 do. On *Diospyros*. Peradeniya.

D. amygdali, Tryon,=*D. pentagona*, Targ. (Prior name) *vide* p. 460, Green, C. of C. V., 1922. Noted on cherry stem, Assam *vide*, Pusa list.

D. calyptroides, *Costa* and *D. echinocacti*. Bouche are synonyms, though they are put down as separate in the Pusa list, and Bouche's name has the priority.

Fiorinia, Targ.

F. fenestrata, Green (*Ms.*) On *Elœocarpus*. Nilgiris.

F. kandyensis, Green, p. 1016, B. J., xxviii, 1922. On unknown shrub. Kandy.

F. secreta, Green. Leonardi brings this under his new genus *Adiscofiorinia*, *vide* p. 52 Genera of *Diaspinæ Fioriniæ*, 1906.

Aspidiotus, Bouche.

A. ambalangoda, Green, p. 1007, B. J., xxviii, 1922. On unknown plant. Ambalangoda, Ceylon.

A. calophylli, Green, p. 1008. do. On *Calophyllum*, Badulla.

A. calophylli, Green, var. *symplocos*. Green, (*Ms.*) *Symplocos* leaves Nilgiris.

A. tripinnatus, Green (*Ms.*) On *Callistemon* leaves, Coonoor.

A. longispinus, Green.* Recently noted on *Bauhinia racemosa*. Tinnevelly, S. India.

A. pinnulifera, Msk. Var *diversicolor*, Green. On Orchid *Cymbidium*, Nilgiris.

A. perniciosus, Comst., p. 304, U. S. Agrl. Report, 1880. On pear, Punjab, *vide* Pusa list.

Aonidia, Targ.

A. columnifera, Green, p. 1008, B. J., xxviii, 1922. On *Turpina* leaves Hakgala.

A. mesochitinosa, Green, p. 1009 do. do. On *Canthium montanum*. Hakgala.

A. mimusopis, Green, p. 1009 do. do. On *Mimusops hexandra*. Trincomalai.

Gymnaspis, Newstead.

G. diospyros, Green (*Ms.*) On *Dispyros embryopteris*. Mundanthorai. S. India.

G. producta, Green (*Ms.*) do. do. do. S. India.

G. affinis, Green (*Ms.*) On *Ficus bengalensis*, Sivalapperi, S. India.

G. mangifere, Green (*Ms.*) On mango leaves do. do.

Aonidia bullata, Green,* is *Gymnaspis bullata*, Green, *vide* Green, p. 460, C. of C. V., 1922.

Lepidosaphes, Schimer.

L. albizziæ, Green (*Ms.*) On stem of *Albizzia lebbeck*. Coimbatore.

L. leucooplœæ, Green (*Ms.*) On stem of *Accaia leucophlœa*. Coimbatore.

L. punctatissima, Green (*Ms.*) On *Albizzia lebbeck*. Coimbatore.

L. punicæ, Green (*Ms.*) On Pomegranate. Coimbatore.

L. dilatilobis, Green, p. 1010, B. J., xxviii, 1922. On unknown shrub. Sigiriya, Ceylon.

Pseudoparlatoria, Cockerell.

P. pusilla, Green, p. 1010, B. J., xxviii, 1922. On cacao. Peradeniya.

Parlatoria, Targ.

P. camelliæ, Comst. Recently recorded from South and N. India on *Melia* and *Aegle*, respectively.
P. cristifera, Green (*Ms.*) On *Citrus* leaves. Maddur, Mysore.
P. limoniæ, Green (*Ms.*) On *Limonia alata*. Tinnevelly.
P. mesuæ, Rth., p. 266, Bull. Ent. Res., v., 1914. On *Mesua ferrea*. Peradeniya.
P. zeylanica, Rth., p. 113, Bom. Journ., xxiv, 1915. On bamboo, Peradeniya.
P. zeylanica, Rth., p. 114 do. do. On *Cinnamomum* Peradeniya.
For this latter species a new name *P. rutherfordi* is proposed by Green, as Rutherford has given same name to two species, *vide* p. 1020, B. J. xxviii, 1922.
P. cinnamoma, Rth., p. 114, B. J., xxiv, 1915. On *Cinnamomum*. Peradeniya.
P. blanchardii, Targ., *vide* Pusa list. On date. Lyallpur.
P. proteus var *crotonis*, Dougl., *vide* Pusa list. On croton. Pusa.
P. cingala var *namunakuli*, Green, p. 1019, B. J., xxviii, 1922. On unknown plant. Badulla.

A NOTE ON THE BIRDS OF KULU

BY

Hugh Whistler, F.L.S., F.Z.S.,

Indian Police.

From the administrative point of view Kulu is the Head-quarters Tehsil of the Kulu Sub-Division of the Kangra District of the Punjab. This Sub-Division includes four main areas, namely, Kulu, Saraj, Spiti and Lahul.

From the point of view of Natural Geography we may consider Kulu as the Upper basin of the River Beas.[1]

The Beas rises on the Rhotang Range of the Central Himalaya at about 13,000′ and its main tributaries are the Parbati, the Sainj, and the Tirthan which all enter it before the river passes from Kulu territory into that of Mandi State.

The whole basin is enclosed by very high ranges with a mean elevation of 18,000′ which separate it from the Spiti, Chenab and Ravi Valleys ; spurs from these ranges extend down to the Banks of the Beas ; a lower range which in its ramifications largely makes up the Saraj Tehsil, separates the Beas basin from the Valley of the Sutlej.

The net result is a mountain area of the wildest character and most beautiful scenery. The lowest altitude is about 3,000′ at the Larji Gorge where the Beas enters Mandi State : from there the main valley rises slowly to Manali 6,000′, the fertile cultivation and level spaces of the lower parts about Bajaura gradually contracting until the Beas has become a rushing mountain river fringed with beautiful Alder beds and frowned upon by rocky precipices.

Cultivation occupies a very small extent of the area ; the greater part of the country is clothed with magnificent forests, while the upper portions of the higher ranges are bare and desolate, wreathed in places with perpetual snow.

The avifauna is purely Himalayan in character with the exception of a small patch of cultivated country about Bajaura 3,600′. Here there are small numbers of species which are typical of the plains of India such as *Corvus splendens*, *Cisticola juncidis* and *Anthus rufulus*, which have somehow colonized this remote area amongst the mountains.

My acquaintance with Kulu is of long standing, having commenced in the year 1910. It has never been my privilege to live in the place but I have altogether been there six times, twice in early winter (November-December) and four times in summer (May-August). This of course is in no way sufficient to allow me to write a proper account of the local avifauna but I have ventured to place my notes on record, so that they may be available as a guide to the casual visitor, or a starting point to any one luckier than myself, who may live in Kulu and prepare a full and detailed account of the birds of a most interesting area. A considerable number of local specimens of birds and eggs are in my collection.

In the main these notes refer to Kulu proper but any observations available regarding Saraj have also been included. I have already published in the pages of the *Ibis* my notes on the avifauna of Lahul and Spiti, the other cantons of the Kulu Sub-Division.

M. Babault who was collecting in India and Ceylon on behalf of the Paris Museum in 1914 visited the valleys of the Beas and Parbatti on his way to Ladakh. His observations have been published in the *Rèsultats scientifiques du Mission Babault* and the pertinent portions have been included here for the benefit of English readers.

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[1] *The Normal Rainfall in the Kulu Sub-division is as follows :—*

	Annual.	Jan.	Feb.	Mar.	Ap.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Banjar...	41·54	3·06	2·89	3·22	2·34	2·27	3·64	9·03	8·99	3·58	0·81	0·56	1·15
Kulu ...	39·19	4·31	4·18	4·50	3·07	2·17	2·34	5·93	6·25	3·33	0·98	0·62	1·46
Nagar...	49·11	5·17	5·38	6·18	3·70	2·55	2·80	7·82	7·73	4·06	1·03	0·88	1·81

A few notes by other observers have also been incorporated into this account, including a list of species furnished by Mr. C. H. Donald to the local Gazetteer.

Corvus corax tibetanus Hodgs. The Tibetan Raven.

M. Babault includes the Tibetan Raven amongst the list of birds that he met with at Tchari Djony between May 27 and June 2, that is to say about the border between Spiti and Kulu. It is of course fairly common in Spiti and Lahul. According to Stoliczka 'only very few come down in winter to Kulu.'

Corvus coronoides intermedius Adams. The Jungle Crow.

The Jungle Crow is a common and resident species throughout Kulu, occurring alike in village, forest and alpine pasture. I have seen it following caravans to the summit of the Rhotang Pass 13,000 ft. and it may be said to go wherever man goes, occupying in this mountain area the position of the parasite on man that *Corvus splendens* is in the plains. Nests with young were observed in May and June.

Corvus splendens Vieill. The House Crow.

It is curious that there is an isolated colony of this Crow in the Kulu Valley about Bhuin and Bajaura : here the species is common for a stretch of about 10 miles, and I have seen a single individual (August 6, 1923) by the Beas a mile above Sultanpur. These birds are resident and have eggs about the middle of June. In the surrounding parts of Kulu they appear to be unknown and I have seen none in Mandi or in the Kangra Valley with the exception of a few birds at Dhelu 4,000 ft. (November 23, 1923).

M. Babault obtained 2 males at Bajaura and attributes them to the race *C. s. zugmayeri*, but these Kulu birds appear to me rather to belong to the typical race. The valley about Bajaura is the habitat of several other familiar birds of the plains, it is interesting to note, such as *Dicrurus macrocercus*, *Anthus rufulus*, and *Cisticola juncidis*.

Corvus monedula (L.). The Jackdaw.

Hume states (N. and E. 2nd ed. I. 12) of the Jackdaw 'I have seen it in the hills in summer as far east as the Valley of the Beas.' It is a pity that he never amplified this record as it has been the basis of a good deal of error regarding the breeding range of this bird, which I have already discussed in the *Journal* (xxix. 161). In any case the occurrence must have been exceptional as in the course of six visits to Kulu, both summer and winter, I have never met with a single Jackdaw.

Urocissa melanocephala occipitalis (Blyth). The Red-billed Blue Magpie.

M. Babault seems to have met with this Magpie fairly commonly in May and June, about the Dulchi Pass, Bajaura, Tchong, and Naggar, and he preserved 4 specimens. This is a slight extension of the known range which was hitherto considered to be bounded on the west by the Sutlej Valley. Although on the look out for the species I have personally failed to meet with it in Kulu.

Urocissa flavirostris cucullata Gould. The Yellow-billed Blue Magpie.

Gould's type of this race was obtained in the Kulu Valley and is now in the British Museum. This Magpie is one of the most common and noticeable birds in Kulu, with its beautiful colour, long graceful tail, and remarkable range of notes. It is found everywhere up to about 7,000 ft. and is particularly common in the Alder groves along the Beas. I have never found the nest but have seen fledged young on June 25.

Dendrocitta formosœ occidentalis Ticehurst. The Himalayan Tree Pie.

I have observed this sobre looking Treepie in Kulu as follows :—A party at Aramghar (5,000 feet) and one at Dhobi on November 30, 1922 : a party including young of the year at Aramghar on July 9, 1923 ; a couple at 5,000 feet in the Parbatti Valley above Jhari on November 10, 1923.

It is common along the Mandi Valley from Mandi to Dhelu.

Garrulus lanceolatus Vigors. The Black-throated Jay.

M. Babault obtained a male at Jhari and a pair on the Dulci ; Pass in May or June. I have observed it as follows :—One on the road at Jaggatsukh on June 18, 1921 ; one by the Beas road at Largi on June 29, 1921 ; one near Katrain on December 6, 1922. It appears to be less common in Kulu than along the outer ranges of the Western Himalayas.

Nucifraga caryocatactes hemispila Vigors. The Himalayan Nutcracker.

Hume says (N. and E. 2nd ed. I. 30) ' my people have taken the nest with young in April below the Jalauri Pass.' M. Babault obtained specimens at Manikaran, Tcho-ti and Pulga in May and June, full feathered young of the year being shot on May 19, at Pulga.

The Nutcracker is a common bird in the Pine Forests of Kulu from 5,000 to 9,000 feet according to the late General Osborn (Journal, B.N.H.S. xv., 712) who says ' in fact it follows the region of the *Pinus excelsa*, the seeds of which furnish it to a great extent with food. The volume of the Journal cited above, contains several notes on a controversy whether the Nutcracker or the Flying squirrel was responsible for damage done to walnuts, which ended in the blame being laid at the rodent's door.

I have observed the Nutcracker in many localities in Kulu. In summer it may always be heard in the Silver Fir Forest about 7,000–9,000 feet on the Bhubhu Pass. I have heard it in June at 9,000 feet in the Nullah below the northern face of the Jalouri Pass. In July at 7,000 feet on the Dulchi Pass, in August above Manali on the Kothi road at 7,000 feet, and in July at 9,500 feet at the entrance to the Hampta Nullah. In November 1923 I saw many pairs from Manikaran to Pulga, 5,000–9,000 feet. In December I have heard it from 6,500 to 8,000 feet behind Katrain and Baragraon.

Pyrrhocorax pyrrhocorax (L.). The Common Chough.

M. Babault observed this species at Tchari-Djony at the end of May, in great numbers at Kothi on June 28, and on the Rhotang on June 29.

During the summer months the Chough may be observed commonly in pairs or in flocks on the alpine pastures from the Beas tunnel at Kothi (8,000 ft.) to the summit of the Rhotang Pass, 13,000 ft. Here I believe they breed here as on May 25, a couple of birds emerged from stick nests in the face of a cliff by Rahla Rest House, which however proved to be quite inaccessible.

They are doubtless common on similar elevations throughout Kulu though I have only the following records :—June 8, 1919, Malasu Nullah a few over the snow ; June 16, 1922, a small party flying high over the Jalori Pass ; September 15, 1923, some at Serahan ; October 31, 1923, 3 on road at summit of Bhubhu Pass. Presumably during the winter they move down to the bottom of the valleys though there is no record on the point.

Pyrrhocorax graculus (L.). The Alpine Chough.

M. Babault obtained a male at Tchari-Djony at the end of May.

According to Stoliczka this chough (which is so familiar in Lahul and Spiti) is in the cold weather specially common in Kulu.

Parus major kaschmiriensis Hart. The Kashmir Grey Tit.

This Tit is a common and resident species along the valleys at altitudes of from 3,000 to 6,000 feet from Manali to Larji along the Beas and in the side valleys at similar elevations. I found a nest with young in the trunk of an alder tree at Raisan on June 19.

Parus monticola Vigors. The Green-backed Tit.

The Green-backed Tit is common in Kulu in a slightly higher zone than the last species, starting in summer at about 5,000 feet. I found a nest with feathered young in a stump at Manali on May 22.

Lophophanes melanolophus. (Vig.). The Crested Black-Tit.

This cherry little Tit is common in summer in the highest forests from about 6,000 to 10,000 feet ; during the winter it descends to a lower zone and then is one of the most prominent members of the hunting parties that are such a feature of Himalayan bird life. I found a nest with naked young on May 25, in a large hole high in the trunk of an oak tree by Rahla Rest House, and another nest with 5 moderately incubated eggs on June 16, in the trunk of a Yew-tree by Shoja Rest House.

There is little to note on this bird's behaviour; he is always busy in the search for food high in some moss-grown giant of the forest, and the soft gold-crest-like note 'chee chee' will be heard long before the tiny bird is seen in the branches above one: sometimes he is alone, at other times two or three wander about in loose companionship, and in winter flocks of up to 50 in number, collect and join the hunting parties. In spring they rest occasionally from the incessant hunt for food, and from the top of some lofty twig utter the loud clear call note 'want you need you want you need you' or deed you 'deed you deed you'.

Lophophanes rufonuchalis rufonuchalis. (Blyth). The Simla Black-Tit.

M. Babault records obtaining a male from Pine forest in the Valley of Kulu in May without giving more exact data.

I came across a party at 10,000 ft. on the northern slope of the Jalouri Pass on June 17, 1922.

It of course breeds commonly in the Junipir forests of Lahul and is probably more numerous in Kulu than the above records indicate.

Machlolophus xanthogenys xanthogenys (Vigs.). The Yellow-cheeked Tit.

M. Babault obtained a male on the Dulchi Pass on April 29. I have not met with the species in Kulu.

Ægithaliscus niveogularis (Moore). The White-throated Tit.

On June 17, 1922, I secured 4 specimens, 2 adults 2 juveniles, from a family party in a patch of sallow scrub; the young had clearly been hatched in the neighbourhood. This was at 9,800 ft. on the Kulu side of the Jalouri Pass not far from the summit.

On November 16, 1923, I almost certainly saw one of these tits in some bushes at 4,800′ by Banjar but a dog disturbed it before I could verify the identification beyond doubt.

Ægithaliscus concinnus iredalei Stuart Baker. The Red-headed Tit.

The Red-headed Tit is fairly common in Kulu and I have met it in summer from 5,500′ up to 7,500′. In winter it descends as low as river level though I have also seen it as high as 6,500′ at that season. In all probability there is little seasonal altitudinal movement in this species.

Sitta himalayensis Jard. and Selby. The White-tailed Nuthatch.

I procured a male on June 17, 1922, at 6,500′ near Jhibbi.

Sitta leucopsis leucopsis Gould. The White-cheeked Nuthatch.

M. Babault procured a pair at Pulga in May and June and remarks that it was more common at Tcho-ti than in the former place. In early November at Pulga I heard a Nuthatch very commonly in the pine forests from 7,000 to 9,000′ and believe that it was this species.

On June 17, 1922, I saw one in company with a party of *Parus rufonuchalis* at 10,000′ on the Kulu side of the Jalouri Pass.

Garrulax albogularis whistleri Stuart Baker. The White-throated Laughing Thrush.

M. Babault obtained two males and a female in the neighbourhood of Bajaura and the Dulchi Pass at the end of April, and he also found a nest containing 2 young birds with feathers commencing to sprout.

Trochalopterum erythrocephalum erythrocephalum Vigors. The Red-headed Laughing Thrush.

Hume says of this Laughing Thrush (N. and Eggs. 2nd edn. vol. i, 55) apparently including Kulu:—'From Kumaon westwards, at any rate as far as the Valley of the Beas, next to *T. lineatum* the most common species of the genus'. I have however only seen a single individual in Kulu and that at Kasol on November 6, 1923.

Trochalopterum variegatum variegatum (Vigors). The Eastern Variegated Laughing Thrush.

This Laughing Thrush appears to be a common bird in Kulu, breeding on the higher ridges from 8,000 to 10,000 ft. and moving down in winter to a lower zone, but I have no very detailed information about it. In Lahul the western form *T. v. simile* occurs and the Rhotang Range is therefore probably one of the boundaries between the two races. It would be interesting to verify which bird is found in the Solang nullah and the forests generally along the southern iace of the Rhotang.

Trochalopterum lineatum lineatum * (Vigors). The Nepalese Streaked Laughing Thrush.

The Streaked Laughing Thrush is one of the commonest birds of Kulu from Larji upwards to a height of at least 8,500 ft. in all the valleys. During summer it is scarce along the bottom of the valley from Sultanpur to Larji though some may always be found in the swamp between Bhuin and Bajaura, and in Kulu, as elsewhere, the bird is doubtless subject to a good deal of altitudinal movement according to season. It keeps much more to the ground than the other species of Laughing Thrush, and shuffles along in tangles of grass, bracken and other low herbage, flirting its wings and jerking the long tail, the members of a flock keeping up an incessant conversational squeaking in low querulous notes. It seldom ascends into trees and when disturbed from the undergrowth it merely flies a short distance down hill and pitches into the nearest cover into which it quickly threads its way out of sight.

Grammatoptila striata striata. (Vig.). The Striated Laughing Thrush.

M. Babault met with this large Laughing Thrush at Kothi on June 28. There appears to be no other Kulu record though as it is common at Koteghar in winter Stolickza may have been right in his conjecture that these birds bred in the higher forests of Kulu.

Pomatorhinus erythrogenys erythrogenys Vigors. The Rusty-cheeked Scimitar-Babbler.

Hume includes the valley of the Beas in his account of the distribution of this species (N. and E. 2nd ed. vol. i, 87) but I have not met with the bird actually in Kulu. It is common in Mandi State and Kangra at elevations from 2,000 to 6,000 ft.

Stachyridopsis pyrrhops (Blyth). Red-billed Babbler.

The Red-billed Babbler is resident and apparently not uncommon in Kulu. I have met with it in June about 5,000 to 5,500′ in the main valley from Sultanpur to Naggar, and in November at Sultanpur 4,000′ and in the Parbatti Valley about Jari 5,000′.

Siva strigula strigula Hodgs. The Stripe-throated Siva.

I met a party of these Sivas on June 17, 1922, in some thick scrub at 9500 to 10,000′ on the Kulu side of the Jalouri Pass : they doubtless breed here and in similar situations on other ranges. In winter they move lower down and I found a flock at 5,000′ on the Kraon road on November 27, 1922.

Ixulus flavicollis albicollis Ticehurst and Whistler. The Yellow headed Ixulus.

There is a patch of Chestnut Forest at 5,500′ on the road below Kraon where I have met with a party of the Ixulus in the same trees in May, July, August, and November. Otherwise I have only procured it in Kulu on December 5, 1922, from 7,000′ in the hill-side jungle behind Katraian.

Pteruthius xanthochloris occidentalis Harington. The Green Shrike-Tit.

Stoliczka says ' Only 3 specimens were shot, in February 1867. in the southern part of Kulu.' There is no other record.

Microscelis psaroides psaroides (Vigors). The Himalayan Black-Bulbul.

In summer this Bulbul breeds throughout Kulu from Larji 3,000′ up to 6,000′ and doubtless higher in all the valleys and on the hill-sides. I have observed a few in November and early December at about 4,000′ to 6,000′ but the majority probably leave to winter in the outer ranges.

* *griscicentior* of Hartert.

Molpastes leucogenys leucogenys, (Gray). The White-cheeked Bulbul.

A common and resident species in Kulu and Saraj from the bottom of the valleys up to a height of about 7,000 ft., I have found nests in June.

Certhia himalayana Vigors. The Himalayan Tree-Creeper.

A fairly common species throughout the Sub-division, usually seen with the mixed hunting parties except in the breeding season. It is a resident but moves altitudinally according to season.

Tichodroma muraria. (L.). The Wall-Creeper.

A common winter visitor to the sub-division where I have seen it in November and December along the valleys from 3,000′ to 5,000′. A few perhaps breed at high altitudes along the Rhotang chain, but of this there is as yet no record.

The Wall-Creeper attracts the attention of the least observant in Kulu by its habit of feeding about the cuttings and retaining walls of the roads, climbing over their surfaces with a jerky mode of progression and a continual downward flick of the outer primaries. It takes to flight with reluctance before the passerby launching out into the air with a hovering undecided flight resembling that of the Hoopoe, a resemblance heightened by the long bill and broad round spotted wings, only to settle again a short distance ahead. It is also very partial to the large boulders that line the sides of the river beds, and it may often be found feeding on the stones close to the edge of the water. I have only once seen it climbing on a tree trunk. It occasionally flies up and endeavours to take an insect on the wing. Nowhere else have I seen this species so common as in Kulu.

Troglodytes troglodytes neglectus Brooks. The Wren.

In Kulu proper I have met with it in small numbers in November and December at heights from 5,000′ to 8,000′, and it is doubtless a resident in the subdivision breeding in a higher zone about the edge of forest growth.

This is one of the Himalayan birds that is most reminiscent to the exile from England, being, as it is, one of the few birds that is a race of an actual British species. It recalls the home bird in its demeanour and ways. Attention is drawn to it by the harsh and rather scolding metallic note ‘ chit chit chittrr ’, as it flies from some tangle of herbage at the foot of a stunted bush to the litter of boulders that mark some forgotten landslide ; it threads its way amongst the stones, now for a space disappearing into the hollows and crevices below them, then emerging on to some stone. There it waits for a moment, the tail cocked upwards and the head stiffly held back, often so far that the beak points almost directly upwards. It is intensely restless, a mass of nerves, incessantly bobbing and bowing, and turning first to one side and then to the other. Usually it is averse to taking flight but progresses amongst stone and hollow in little jerks and starts, with short flights of merely a foot or two ; but once convinced that danger threatens it leaves for distant cover with a flight that is straight and strong and fairly fast. The song is loud and cheerful, as in the English bird, and is freely uttered in the bleakest of surroundings where drifts of snow coil amongst the debris of a rockbound nullah.

Pnœpyga albiventer pallidior Kinnear. The Scaly-breasted Wren.

In November and December I found this quaint little ball of a bird fairly common in the valleys of Kulu and Inner Saraj between 3,600′ and 6,500′. It is a most arrant skulker keeping to thick bracken and evergreen undergrowth, preferably in the alder groves, in the dampest and most secluded situations. I have even found it in the water-logged tussocks of the Bhuin marsh. It creeps about close to the ground like a mouse and hardly ever takes to wing, and specimens may be secured only with the greatest difficulty. The call is a loud single note, quite unlike that of *Troglodytes*, but more warbler-like in character.

Tesia castaneocoronata castaneocoronata (Burton). The Chestnut-headed Wren.

The western limit of this beautiful wren is given in the Fauna as Garhwal bat in November and December I found that it was not uncommon in the Kulu Valley about Sultanpur, and it was also reported to me from the Parbatti Valley. It was found in similar situations as *Pnoepyga a. pallidior* and has similar habits. The call note is a loud slightly double squeak, rather reminiscent of the note of *Phylloscopus humii*.

Cinclus cinclus cashmeriensis Gould. The Kashmir Dipper.

M. Babault met with this species about Pulga and Garampani between May 17 and June 4. I have not met with it in Kulu though it occurs at the Chandra Lake 14,000′ and in Spiti at 13,000′ across the border.

Cinclus pallasii tenuirostris Pallas. The Brown Dipper.

The Brown Dipper is one of the most characteristic of the birds of Kulu and Saraj, where it is found throughout the year on the Beas and its various tributary streams : during the summer it is found up to 9,000′ and 10,000′ : but in the winter the birds become distinctly more common in the main valley and its probable that they then leave the highest zone of their summer habitat. I have not been able to find the eggs but birds in the spotted juvenile plumage are to be seen about in May and it is probably an early breeder.

The Dipper is a most active bird, never still and always busy. The harsh call ‘ dzchit dzchit ’ is a familiar sound along every stream, shrill enough to be heard easily above the roar of the waters ; it heralds the approach of the small plump brown bird that flies swiftly along a foot or two above the surface of the water, swaying from side to side amongst the boulders and only making a detour over land to avoid some intruder at the water's edge ; the wings appear rather small for the stout body and to make up for this they are vibrated very quickly in flight in sustained beats followed by a pause.

Settling on a stone the bird bows and jerks from side to side, or immediately starts feeding, keeping its foot-hold easily on slippery stones and disappearing under water either diving or walking. It swims freely on the broader pools, looking like a miniature moorhen, now and again diving and disappearing for a space.

On one occasion I was watching a Dipper standing on a rock and preening its plumage when the mate arrived. The first bird immediately stretched itself high on its legs, with the tail pointing straight downwards, and the head and neck extended to their full length with the beak pointing to the sky ; it stood thus for some time with the wings whirring rapidly, the whole doubtless forming a courting display.

Larvivora brunnea (Hodgs.). The Indian Blue Chat.

M. Babault obtained a male at Pulga in May or June. I believe that I heard the song near Diwal village above Manal's at 7,000′ on July 11, 1923.

Hodgsonius phoenicuroides (Hodgs.). Hodgson's Short-wing.

M. Babault obtained 2 females at Tchari-Djony and noted the species about Pulga and Garampani at the end of May or beginning of June.

Mr. Wells kindly presented me with a male which he had shot from a nest containing 3 young (hatched on July 8, 1922) near Chikka 10,000′ in the Jaggatsookh Nala. The nest was a cup of coarse grass lined with hair, placed about a foot from the ground in a low bush amongst some large boulders. A second nest was also found.

Saxicola caprata bicolor Sykes. The Pied Bush-Chat.

The Pied Bush-Chat is a summer visitor to the lower parts of the Kulu Valley and breeds in abundance up to a height of about 4,000′, from Larji to Sultanpur and Manglaur.

Saxicola torquata indica Blyth, The Indian Stone-Chat.

Hume states (N. and E. 2nd ed. ii. 48) that he has found numbers of the nests in the valley of the Beas below Bajaura, but he presumably means at higher elevations on the hillsides ; for in my experience the Stone-Chat does not breed in the same area as *S. c. bicolor* but occupies a higher zone from 4,000′ upwards, commencing in the valley only about Sultanpur and becoming common about 6.000′ as at Manali and Banjar. M. Babault procured specimens at the foot of the Rhotang and in the Parbatti Valley.

During the winter the species is fairly common along the valley from Katrain to Bajaura.

Oreicola ferrea ferrea (Gray.). The Western Dark-grey Bush-Chat.

Hume says (N. and E. 2nd ed. ii. 51), ‘ I have found many nests in Kulu . . . one near Sultanpur.’ This Bush Chat breeds commonly throughout Kulu and Inner Saraj at elevations from 5,500 to 8,000′. The majority probably leave the Sub-division in winter but in November and December I met with a few along the valley from Sultanpur to Bhuin.

Œnanthe deserti (Temm.). The Desert Wheatear.

According to Stoliczka the Desert Wheatear occasionally winters in Kulu ; if so it would be of interest to discover which race is represented by these birds.

Enicurus maculatus maculatus Vigors. The Western Spotted Forktail.

The Forktail is a familiar species on the streams of the Kulu Sub-division being found at all elevation up to about 8,000′. It is a resident bird and probably not subject to any particular altitudinal movements according to season. It attracts the attention of even the least observant by the conspicuous black and white plumage, with the distinguishing white cross of St. Andrew across the back, and the long-forked tail which is swayed upwards and downwards vertically, slowly and with infinite grace, as the bird moves about the stones and banks of the streams that it frequents. The Forktail is not shy and continues to feed even in the near presence of an observer, sidling and turning on the stones, now facing one way, then turning round to the other. The call is loud and distinctive, and in the woodbound streams of the side nullah, is often the only indication of the bird's presence as it flies up or down the stream through the undergrowth disturbed by the approach of an intruder.

Babault found naked young in a nest on June 7.

Microcichla scouleri scouleri (Vigors). The Little Forktail.

The Little Forktail appears to be not uncommon in Kulu and Saraj for I have met with at least 2 pairs at Banjar 4,500′ in June, a pair below Manali at 6,000′ one at Rahla 8,800′ and one at Jhikka 10,000′ (Hampta Nala) all in July. In November and December I have found it in the Beas Valley at Sultanpur 4,000′, and in the Parbatti Valley at Jari, Kasol, and Manikaran 4,000–6,000′.

Phœnicurus frontalis (Vigors). The Blue-fronted Redstart.

This handsome Redstart breeds at 13,000′ amongst the rocky ledges of the summit of the Rhotang Pass, where I have observed it in June. In the same month it also breeds in the scrub on the northern face of the Jalouri Pass at 10,500′. Babault collected a pair in May or June at Ghary and says that he often surprised them in the bushes on the bank of the Parbatti, which seems curiously low for this species in summer. It doubtless breeds along the summit of all the high ranges in the Sub-division.

In November and December I have observed the species on the hillside behind Katraian and at Pulga 7,000′.

Phœnicurus ochrurus phœnicuroides (Moore). The Black Redstart.

On July 27, 1922, I observed a few Black Redstarts below the summit of the Hampta Pass at 13,000′ and they probably breed here as they do in Spiti and Lahul, where they are amongst the most characteristic birds of those high valleys. Babault collected a pair at Manikaran and a male on the Rhotang, but he gives no details to show whether the Manikaran birds were breeding or on passage. There are no winter records for Kulu so perhaps the Sub-division, like the Simla and Dharmsala ranges, lies outside the winter range and regular migration routes of this common and wide-spread species.

Chaimarrhornis leucocephalus (Vigors). The White-capped Redstart.

During the breeding season the White-capped Redstart is common and breeds on the Beas from 7,000 ft., above Manali, to its source on the Rhotang Pass 13,000 ft., and doubtless at similar elevations on all the larger streams. I have found fresh eggs at Rahla on July 11, and on the same day another half-built nest, so it appears to be somewhat of a later breeder than most birds. At this season it is distinctly a bird of high elevations and may be found up to 16,000 ft., in Lahul and elsewhere. During the winter months the species moves down to a lower zone and the birds are then extremely common throughout the valleys of Kulu, and even lower down into the foot-hills of the Himalayas.

Like the Plumbeous Redstart, the White-capped Redstart is most strictly a water bird but it differs from the former in its wider interpretation of what the term 'water' includes: for in addition to the rivers, streams and rills, it is found about wet mossy cliffs, precipitous marshy banks and similar situations in which the Plumbeous Redstart does not occur. Like it, however, it is pre-eminently a bird of boulders amongst rushing water, and here the two species are found together, fly-catching with little erratic flights from stone to stone. As with most Redstarts, the tail is an expressive organ. Continuously the bird beats the tail up and down, from well above the line of the back almost to touch the stone on which it is sitting, frequently accompanying the action with a deep bow; and this is done with the tail either closed or partly spread. As it starts to fly or settles the tail is fanned open, a glorious glimpse of chestnut and black. The ordinary call note is a loud plaintive squeak 'teeee' audible some way off.

Rhyacornis fuliginosus (Vigors). The Plumbeous Redstart.

The Plumbeous Redstart is one of the commonest and most characteristic birds of Kulu and Saraj. It is never found away from the rivers and larger streams, and with that reservation, may be looked for anywhere between 4,000 ft. and 10,000 ft., in summer. It does not, however, care for the broader and hotter stretches of the Beas between Sultanpur and Larji. During the winter it leaves the higher zone of its range, and while at that season great numbers pass down to the waters of the foothills, it remains sufficiently common in Kulu up to at least 6,000 ft. It breeds throughout its range in May, June and July. The nests are built on ledges of rocks, in holes under earthern banks, in crevices between boulders and stones, in hollows in the trunks of Alder trees, in ivy on tree trunks and any similar situation, always provided that it is within a few yards of the water's edge.

The nest is a neat cup made of moss mixed with a few roots and leaves, and is lined with fine roots and fibres and occasionally wool and hair. The eggs are pale greenish in colour speckled and blotched fairly heavily with markings of reddish brown. They are usually four in number.

These graceful little birds strike the notice of even the least observant. No patch of stream is without its pair which spend all their time on the boulders in the middle of the rushing water, with occasional excursions to the bank or the bough of some handy tree. They flit from stone to stone and continuously make erratic little fluttering darts into the air after some passing insect; and as they settle the conspicuously coloured tail, chestnut in the cock, black and white in the hen, is slightly fanned and wagged up and down, the movement being repeated at intervals until the next little dart into the air. They are as quarrelsome as restless, and appear to have sharply defined territories, for the male with a provocative little snatch of song is alway launching attacks at the intruder from some other pair, dashing at it and chasing it back to its own borders, regardless of sex. The short song is rather sweet and jingling and the hen also shares it; it may be heard occasionally in winter as well as in the breeding season. It is uttered either from some boulder in midstream or in the air as the little bird slowly flies with even movement but rapidly vibrating wings in a short parabola from one rock to another.

Cyanosylvia cyanecula abbotti Richmond. The Bluethroat.

A fine adult male Bluethroat was seen at Manali on May 23, 1921, at 6,000 ft. but I could not obtain it. From the bright colour of the breast I attributed it to this form.

Grandala cælicolor Hodgs. Hodgson's Grandala.

This rare and beautiful bird must breed at high elevations at the head of the Parbatti Valley, as Babault procured a male and female with the organs developed at Tchari-Djony between May 27, and June 2, 1914. It may be noted also that Stewart obtained some specimens from the collection of a Mr. Procknow, a missionary at Koteghar, which the latter said were 'strictly mountaineers and only got several marches in near the snow' (Zoologist) 1886, 439).

Calliope pectoralis pectoralis Gould. The Himalayan Rubythroat.

Babault obtained a male at Ghary on May 13.

Rubythroats breed on the ascent to the Rhotang Pass at about 12,000 ft. amongst boulders on the open hillside, a locality in which I have observed them in June, July and early August.

Tarsiger chrysaeus whistleri Ticehurst. The Golden Bush-Robin.

I saw a male at Jari 5,000 ft. on November 6, 1923.

Ianthia cyanura pallidiora Stuart Baker. The Red-flanked Bush-Robin.

In the middle of June I have found this species common and breeding from Shoja to the summit of the Jalouri Pass in the forest zone between 9,000 ft. and 10,000 ft., and it doubtless breeds on similar ridges throughout the Sub-division. One was seen at 6,500 ft. behind Katraian on December 3, 1922.

Adelura cæruleocephala (Vigors). The Blue-headed Robin.

In Nests and Eggs 2nd ed. vol. ii, 69, Hume records the taking of an egg of this species in the Humpta Nala at about 11,000 ft. He admits to the possibility of error, and the description certainly does not agree with eggs that I have taken in Lahul.

In winter this bird appears in the valleys of Kulu and Saraj and I have seen it in November and December from 4,000 ft. to 7,000 ft. both at Banjar and along the Beas Valley.

Saxicoloides fulicata cambaiensis (Lath.). The Brown-backed Indian Robin.

Stoliczka states that this familiar species is common in Kulu but I have not met with it ; its existence there seems unlikely.

Copsychus saularis saularis (L.). The Magpie-Robin.

Observed in fair numbers at Sultanpur 4,000 ft. in May, June, and July, nests with feathered young being found on June 23 and July 29. A pair were seen at Manglaur Rest House, Inner Saraj 3,800 ft. on June 19, 1922. It is a summer visitor only and apparently leaves in August.

Turdus atrogularis Temm. The Black-throated Thrush.

A common winter visitor observed in the valleys in November and December.

Turdus unicolor Tickell. Tickell's Ouzel.

Only observed at about 6,000 ft. towards Manali, where I have seen one or two in May, June and July.

Geocichla wardi (Jerdon). The Pied Ground-Thrush.

I found a small flock of 5 or 6 individuals at 6,000′ near Manali on May 24 and 25, 1921. They were feeding in brush-wood in a small wooded nullah by cultivation and flew up into the trees when disturbed.

On July 5, 1923, I met with a pair with newly fledged young in a similar spot by Kraun Rest House 6,000′.

Arceuthornis viscivorus bonapartei (Verr.). The Missel Thrush.

Babault met with the Missel Thrush on the Dulchi Pass between April 29, and May 1. Hume obtained the nest above Juggutsukh. On June 16, 1922, I saw 2 or 3 at 10,000′ along the crest of the Jalouri ridge in the forests of Kharshu Oaks, whence they came to feed on the open summit of the ridge.

On December 8, 1922, 2 were seen in the Birch forest above Baragraon near Katraian.

Oreocincla mollissima (Blyth). The Plain-backed Mountain-Thrush.

Babault obtained a male at Tcho-Ti in May or June.

Oreocincla dauma dauma (Lath.). The Small-billed Mountain-Thrush.

I saw what was probably one of these Thrushes on the road below Manali 6,000′ on May 22, 1921.

Monticola erythrogastra (Vigors). The Chestnut-bellied Rock-Thrush.

On November 30, 1922, I saw 2 males flying together about the tops of some Alder trees in the Aramghar marsh near Raisan 4,500′. Babault found the species at Ghary and Tchong in the breeding season.

Monticola cinclorhyncha (Vigors). The Blue-headed Rock-Thrush.

A common summer visitor noted in May, June, July and August from 5,000′ to 6,000′.

Monticola solitaria pandoo (Sykes). The Blue Rock-Thrush.

On June 23, 1922, I found a nest with 4 partly feathered young in a rocky bank above cultivation in the valley below Sultanpur at 4,000′. A few birds noted about this area in June and July and a male seen at 6,000′ above Manali on June 17, 1921, complete my Kulu records for the species. Babault however procured several specimens in May or June at Ghary, Manikaran, Pulga and Tcho-ti.

Myiophoneus temminckii temminckii (Vigors). The Himalayan Whistling-Thrush.

The Whistling Thrush with its deep blue black plumage and yellow bill must often be mistaken in Kulu by tourists and sportsmen for the English blackbird. It can indeed escape the notice of few as it is excessively common throughout the valleys up to 11,000′ in summer and to a slightly lower elevation about 8,000′ in winter, while its large size, bold demeanour and noisy calls invariably draws attention to it. Primarily it is a bird of the rivers and mountain streams, but its strong flight enables it to wander freely about the precipitous crags and heavy woods that line every valley, and there is scarcely any piece of Kulu scenery that the traveller will stop to regard without sooner or later seeing one of these birds dash across the picture, and without hearing the melodious whistle or the harsh loud song mingling with the roar of the waters and easily rising above it ; there is a peculiarly eerie squealing character in the song which truly matches it with its surroundings.

There is something very tight-trussed about the appearance of the Whistling Thrush as he hops and flies from boulder to ledge, from the ground to the broad branches of the alders and chestnuts ; his hard shiny feathers are pressed close to the body and as the long tail sways slowly upwards above the long legs he has all the appearance of balancing on tip-toe, like a smart recruit awaiting his sergeants' word of command.

The nest is easily found, for it is a large massive cup of the usual Blackbird type and the bird depends for its protection, not on concealment but on the inaccessibility of its site, placing it on some rocky ledge or in a hollow on the face of a mighty boulder overhanging a rushing stream. Eggs may be found from April to July ; they are very fragile and in appearance resemble large and very faded specimens of Blackbird's eggs.

Prunella collaris (Scop.), The Alpine Accentor.

One was seen on the road just above Manikaran at 6,500′ on November 10, 1923, but the specimen was not obtained for racial identification.

Prunella himalayanus (Blyth). The Altai Accentor.

On December 8, 1922, I found this Accentor common in parties on the Kharshu Tharch, behind Baragrown, about 9,000′. Some parties of birds seen in similar ground above Pulga on November 9, 1923, were also apparently of this species.

Hemicheledon sibirica gulmergi Stuart Baker. The Kashmir Sooty Fly catcher.

Breeds commonly throughout Kulu in the forests above 5,000′ up at least to 8,500′ and is a summer visitor only ; an occupied but in accessible nest, 40 feet from the ground on a side bough of a silver fir, was seen on June 15 and fledged young were seen on July 1.

Siphia strophiata Hodgs. The Orange-gorgetted Flycatcher.

Breeding birds were observed at 9,000–10,000′ on the Shoja side of the Jalouri Pass on June 17, 1922.

Cyornis superciliaris (Jerd.). The White-browed Blue Flycatcher.

A commer summer visitor to the forests throughout Kulu breeding from 6,000′ to 10,000′. I found a nest containing newly-hatched young on May 24, placed in a hollow of the bark of an alder.

Stoparola melanops melanops (Vigors). The Verditer Flycatcher.

A summer visitor observed from the bottom of the valley up to 8,000′ but not so common as in the outer Himalayan ranges.

Alseonax latirostris poonensis (Sykes.). The Brown Flycatcher.

Breeds fairly commonly along the Beas Valley from Sultanpur 4,000′ to Larji 3,200′ and in the Tirthan Valley to Manglaur 3,800′ ; a summer visitor only. Lays in May and June.

Alseonax rubricaudus (Swains.) The Red-tailed Flycatcher.

M. Babault obtained two males and two females at Pulga at the end of May and judged from their organs that they were breeding.

Culicicapa ceylonensis ceylonensis (Swains.). The Grey-headed Flycatcher.

A common summer visitor to Kulpu breeding in the Zone from 5,000′ to 7,000′.

Niltava sundara sundara Hodgs. The Rufous-bellied Niltava.

I procured a female in the undergrowth at 7,000′ on the ascent to the Bhubhu Pass on August 9, 1923. According to Hume (N. and E. 2nd ed. ii. 20) the species breeds in the valley of the Beas.

Tersiphone paradisi (L.). The Paradise Flycatcher.

The lovely adult male Paradise Flycatcher with his black-crested head, snowy plumage, and ribbon-like tail feathers is a familiar sight to the traveller along the roads of the valley. It is common from Larji up all the valleys to a height of about 5,000′ but of course only as a summer visitor.

Lanius vittatus Valenc. The Bay-backed Shrike.

A common summer visitor to the Beas Valley between Larji and Bajaura breeding early in June.

Lanius nigriceps nigriceps (Frank.). The Black-headed Shrike.

M. Babault obtained a male at Pulga and a female at Bajaura in May or June.

Lanius schach erythronotus (Vigors). The Rufous-backed Shrike.

This fine shrike breeds very commonly in June along the valley of the Beas and Tirthan from Larji 3,200′ to Banjar 5,000′ and Sultanpur 4,000′ ; a few pairs extend up to Manali 6,000′. Odd shrikes may be observed in the valleys in winter but they may belong either to this form or to *Lanius tephronotus* which is the breeding shrike of Lahul (as a summer visitor only).

Lanius cristatus subsp. ? The Rufous-tailed Shrike.

Hume's remarks [(N. and E. 2nd ed. i. 327) imply that some form of this shrike appears in the valley of the Beas in the late autumn, on migration from Yarkand, but I have no more definite information on the point].

Pericrocotus brevirostris brevirostris (Vigors). The Short-billed Minivet.

The scarlet and black minivets with their grey and yellow mates attract the attention sooner or later of most travellers in Kulu from their conspicuous colouration and their pleasant calls. They breed throughout the forests of Kulu from about 5,000′ to 8,000′ and probably higher and in the spring and autumn may be seen anywhere in parties. The majority leave Kulu in winter but I have seen a few about Sultanpur, Kasol and Bhuin, in November.

Pericrocotus speciosus (Lath.). The Scarlet Minivet.

M. Babault obtained a female at Garampani, and a pair at Pulga in May.

Pericrocotus roseus roseus (Vieill.). The Rosy Minivet.

M. Babault obtained a pair at Bajura in May or June.

Dicrurus macrocercus Vieill. The King-Crow or Black Drongo.

The king crow is a summer visitor to the valley of the Beas and the Tirthan at elevations of 3,000–3,500′ from below Sultanpur to Larji and Manglaur. Eggs may be found at the end of May and throughout June.

Dicrurus leucophœus longicaudatus Hay. The Ashy Drongo.

The Ashy Drongo is a common summer visitor to Kulu and Saraj from 3,000′ up to 8,000′ and probably even higher. The majority of eggs are laid in June.

Acrocephalus dumetorum Blyth. Blyths' Reed Warbler.

While marching through Kulu from May 17 to 25, 1921, I met with this species in some numbers from Kraun 6,000′ to Sultanpur 4,000′ and along the Beas up to Manali 6,000′ along the road. It was then on the spring passage, and had for a month previously been similarly common in the Kangra Valley and at Dharmsala. It was not however observed in Lahul which was obviously out of its line of passage, and by my return from Lahul to Kulu on June 15, it had vanished.

Orthotomus sutorius sutorius (Forst.). The Tailor-bird.

One was heard by the Sultanpur Dak Bungalow 4,000′ on June 21, 1921.

Cisticola juncidis cursitans (Frankl.). The Fantail Warbler.

Observed in small numbers about the marshy ground below Bajaura, 3,500′ in June 1921 and 1922 ; it must breed in this locality.

Phylloscopus affinis (Tick.). Tickell's Willow-Wren.

M. Babault obtained 2 males and 2 females at Tchari-Djony and Ghary in May and June.

Phylloscopus pulcher kangrœ Ticehurst. The Orange-barred Willow-Wren.

This willow-wren breeds fairly commonly in June about 9,000–10,000′in the scrub and forest about the summit of the Jalauri Pass and doubtless on the other similar ranges. I procured fledged young at Rahla 8,800′ on July 11, 1923.

Phylloscopus proregulus simlaensis Ticehurst. Pallas' Willow-wren.

A common species in November and December along the valleys up to at least 5,000′.

Phylloscopus maculipennis (Blyth). The Grey-faced Willow-wren.

A single specimen was obtained on November 15, 1923, at 4,500′ by the river at Banjar.

Phylloscopus inornatus humii (Brooks). Hume's Willow-wren.

One was seen carrying food in scrub and oak jungle at 10,000′ on the summit of the Jalauri Pass on June 17.

Observed in the valley at Sultanpur and Bajaura in November.

Phylloscopus nitidus viridanus (Blyth). The Greenish Willow-wren.

One or two were observed by the river at Manali 6,000′ on May 22, 1921, and a specimen was procured. Willow-wrens apparently of this type were seen at 10,000′ on the Jalauri ridge on July 16, 1922.

Phylloscopus occipitalis occipitalis (Blyth). The Large-crowned Willow-wren.

This is the common breeding species throughout Kulu at elevations from 5,000 to 8,000′ ; probably a summer visitor and passage migrant only.

Phylloscopus trochiloides trochiloides (Sundev.). Blyths' Crowned Willow-wren.

Procured by M. Babault at Ghary and Pulga in May.

Seicercus burkii whistleri Ticehurst. The Black-browed Flycatcher-Warbler.

Breeds fairly commonly in the deep scrub at 9,500–10,000′ about the summit of Jalauri Pass in June, and doubtless on all the similar ranges of Kulu. Single specimens were seen in the Bhuin marsh 3,600′ on December 10, 1922 and below Kraon at 5,000′ on November 1, 1923.

Seicercus xanthoschistos albosuperciliaris (Jerd.). The Grey-headed Flycatcher-Warbler.

A very common species in Kulu breeding throughout the valleys from 3,000′ apparently up to 8,000′, and probably remaining at much the same elevations throughout the winter.

Horornis pallidus pallidus (Brooks). The Pale Bush-warbler.

This bird appears to breed commonly about 6,000′–8,500′ in the nullahs above Manali where I have heard it in song in July and on August 1. In November and December I have procured specimens in the bottom of the valley about Katrain 5,000′ and Sultanpur 4,000′.

Suya crinigera crinigera Hodgs. The Brown Hill-warbler.

A common and resident species found from 3,000′ up to 5,500′ and probably higher in all the valleys.

Oriolus oriolus kundoo Sykes. The Golden Oriole.

A common and general summer visitor to the valleys occurring up to 6,000′ ; most numerous along the Beas Valley from Sultanpur to below Bajaura. Breeds in the latter half of May and in June.

Oriolus luteolus luteolus (L). The Black-headed Oriole.

According to Stoliczka this oriole is ‘ occasionally seen in the Kulu Valley between 4,000′ and 5,000′.’

Temenuchus pagodarum (Gmel.). The Brahminy Mynah.

An abundant summer visitor to the Beas Valley from Sultanpur 4,000′ to Larji 3,000′, and Banjar 5,000′ along the Tirthan Valley. One was seen towards Naggar at 4,500′ on August 6, 1923. Breeds in June and July.

Acridotheres tristis tristis (L.). The Common Mynah.

An abundant resident throughout the valleys up to about 7,000′. Breeds in May and June.

Æthiopsar fuscus fuscus (Wagl.). The Jungle Mynah.

Observed in June and July only along the Beas Valley from below Bajaura 3,500′ to Manali 6,000′ but not very common.

Uroloncha punctulata (L.). The Spotted Munia.

A pair were seen at 6,000′ above Kraun at the foot of the Bhubhu Pass on July 2, 1921, and a pair by Banjar Rest House 5,000′ on November 16, 1923.

Perrisospiza icteroides (Vigors). The Black-and-Yellow Grosbeak.

A male shot at Naggar on January 1, 1904, was sent to the Bombay N. H. Society by General Osborn who stated that it was a winter visitant only (J. B. N. H. S., xv. 716). This however is incorrect. The species is a fairly common resident in Kulu and Saraj occurring at all elevations (I have seen a pair in an oak wood at 3,000′ on the bank of the Beas just above Larji on June 10) but most numerous in heavy pine forest from 7,000′ to 10,000′.

Mycerobas carnipes (Hodgs.). The White-winged Grosbeak.

On November 9, 1923, I saw 2 or 3 in Silver-fir forest at 9,000′ above Pulga.

Mycerobas melanoxanthus (Hodgs.). Spotted-winged Grosbeak.

M. Babault observed this species at Palga and obtained a pair at Ghary on June 6, with the organs in breeding condition.

Pyrrhula erythrocephala (Vigors). The Red-headed Bullfinch.

M. Babault obtained specimens at Ghary and Pulga in May or June. I found a pair on June 16, 1922, at 10,000′ on the northern slope of the Jalauri Pass where they were evidently breeding. In winter I observed a couple near Kasol on November 6, and several about 6,500′ behind Katrain in the first week of December. According to Stoliczka numbers appear in Kulu in winter, but this must really refer to a concentration in the valleys of the birds which breed in summer along all the higher ranges.

Loxia curvirostra himalayana Blyth. The Himalayan Cross-Bill.

M. Babault states that he has procured a pair at Pulga (May or June) and also seen it at Manali (June).

Pyrrhospiza punicea humii Sharpe. The Red-breasted Rose Finch.

On July 27, 1922, I shot a male at 13,000′ in the Humpta Nala where it was feeding on rocky ground amongst patches of snow.

Carpodacus rhodochroa (Vigors). The Pink-browed Rose Finch.

This Rose Finch breeds at high elevations, probably 9,000′ to 11,000′, on the ranges in Kulu and Saraj. M. Babault saw fledged young somewhere near Ghary as early as May 11.

In winter it moves down the hillsides and may be found as low as 4,500′ along the valleys. It is not uncommon.

Carpodacus erythrinus roseatus (Hodgs.). The Common Rose Finch.

M. Babault met with this finch at Bajaura in May, and at Ghary and Tchong. These birds were probably late migrants as I doubt whether the species breeds to the south of the Rhotang Range. It of course breeds commonly in Lahul and Spiti.

Carduelis caniceps caniceps (Vigors). The Himalayan Gold Finch.

A few gold finches were oberved at Bajaura 3,600′ on June 22–23, 1921, and of these two were birds in juvenile plumage. In November and December flocks were met with in the Alders along the Beas from Katraian to below Bajaura.

Callacanthis burtoni (Gould). The Red-browed Finch.

Two males with the organs developed were obtained by M. Babault at Tchari-Djoni (Tcho-Ti) at the end of May or beginning of June.

Acanthis flavirostris brevirostris (Moore). Eastern Twite.

According to Stoliczka this Twite visits Kulu in winter.

Serinus pusillus (Pall.). The Gold-fronted Finch.

I observed some flocks about the hillsides at 6,000′-6,500′ behind Katraian in the first week of December 1922.

Hypacanthis spinoides (Vigors). The Himalayan Green Finch.

M. Babault obtained a male (with the organs undeveloped) at Kothi 8,000′ at the foot of the Rhotang Pass on June 28. In summer it appears to be common anywhere in Kulu up to a height of at least 9,000′, but I only once met with it in winter, below Jari on November 5. The movements of this finch in the Western Himalayas are difficult to understand and detailed records regarding it are badly needed.

Passer domesticus indicus Lard and Selby. The House Sparrow.

The House Sparrow breeds abundantly in Kulu and Saraj up to a height of 7,000′, laying chiefly in May. In winter it probably deserts the higher part of this range but is certainly common along the valley of the Beas at that season.

Passer rutilans debilis Hart. The Cinnamon Sparrow.

The Cinnamon Sparrow is common in May and June in the Alder groves of the Beas from Katraian to Kothi 5,000′-8,000′, and at similar elevations in the other valleys; down to 4,000′ it is less common. A certain number were observed about 4,000-5,000′ in November, but many probably move to the outer ranges in winter.

Montifringilla nivalis adamsi Adams. Adam's Snow Finch.

A specimen from 'Kulu' is in the Gould collection in the British Museum, and Stoliczka states that this bird visits Kulu in winter. In summer it breeds abundantly in Spiti but not in Lahul.

Montifringilla nemoricola altaica (Evers.). Stoliczka's Mountain Finch.

I have observed this Mountain Finch from May to August about 13,000′ on the summit of the Rhotang Pass, feeding round the patches of melting snow on the bare hillsides. In winter it moves down into Kulu (S. F. i. 42) and there is a specimen from 'Kulu' in the Gould collection, but I have little definite information on the point. I observed some on the Kharshu Tharch above birch behind Baragraon on December 8, 1922, and on the Tharches about 9,500′ at Pulga on November 8, 1923. It probably is abundant at some seasons in winter as large numbers visit the outer ranges about Simla and Dharmsala.

Montifringilla brandti hœmatopygia Gould. Brandt's Mountain Finch.

Stoliczka states that this finch visits Kulu in winter.

Emberiza fucata arcuata Sharpe. The Grey-headed Bunting.

Observed at Manali 6,000′ on May 23, near Kraun 5,500′ on July 1, and above Jaggatsukh at 9,000′ at the entrance to the Humphta Nala on July 28. It is not uncommon and in the last locality the males were in song sitting on the herbage in some open patches, which were waist deep in balsam, wild parsley, nettles and the like. The song is only a moderate performance.

Emberiza leucocephala (Gmel.). The Pine Bunting.

A common winter visitor to the valley, observed in November and December at 3,500′-5,500′ at Katraian, Bhuin, and Bajaura.

Emberiza stewarti Blyth. The White-capped Bunting.

This Bunting breeds from May to July in some numbers in the cultivation of the Beas Valley just below Sultanpur 4,000′, and also apparently along the Kraun Road up to 5,000′. The former is probably the locality from which Hume obtained eggs (N. and E. 2nd ed. vol. ii, 167). The song is of the typical bunting type but short and hard. The alarm note is a sharp ' tit ' like that of *Horeites brunneifrons*.

I observed a flock on November 30, and December 9, in some thorn bushes on the road between Sultanpur and Raisan.

Emberiza cia stracheyi Moore. The Eastern Meadow Bunting.

Breeds commonly from about 7,000′ to 10,000′ and in smaller numbers down to 5,000′. Eggs may be found from May to August. In winter it is common from about 6,500′ downwards.

Melophus melanicterus (Gmel.). The Crested Bunting.

Occurs in small numbers in June about Banjar 5,000′ and Bajaura 3,600′, evidently as a breeding summer visitor.

Chelidon urbica Subsp.? The House Martin.

Stoliczka states that a House Martin which he calls *caschmirensis* is common in the Kulu Valley. On August 5, 1923, I saw a large migrant flight of Martins on the road near Naggar. No specimens were obtained but the birds appeared to belong to the typical form and not *caschmirensis*. Probably both occur on migration and one or other form may breed in the highest nalas.

Ptyonoprogne rupestris (Scop.). The Crag Martin.

In 1922 I saw a few about Katraian on December 1-3, and a large flock near Bandrole on December 9. In 1923 I saw a large flock below Jari on November 5.

Hirundo rustica L. The Swallow.

Hume states (N. and E. 2nd ed. vol. ii, 184) that he found the swallow ' breeding at one or two bungalows between Sultanpur in Kulu and Simla. I have no more definite record for Kulu.'

Hirundo smithii Leach. The Wire-tailed Swallow

M. Babault obtained a male at Sultanpur. One or two pairs breed near Bajaura where I saw fledged young on June 29. A summer visitor only.

Hirunda daurica nepalensis Hodgs. Hodgson's Striated Swallow.

This form of Striated Swallow is a common summer visitor to the valleys from 3,000′ up to about 5,000′, building its nest under rocks on steep hill sides, Eggs are laid in June. Observed from May to August.

Motacilla alba dukhunensis Sykes. Eastern White Wagtail.

A few were observed at Sultanpur 4,000′ in November and December.

Motacilla alba personata Gould. The Masked Wagtail.

I found a nest with 5 young in quill and 2 addled eggs on a Shingle bank of the Beas near Raisan 4,500′ on May 21, 1921. A full account of this nest has appeared in the Journal, B. N. H. S., xxix. 282.

A few were observed near Sultanpur 4,000′ and Bajaura 3,600′ in November 1922 and 1923.

Motacilla alba alboides Hodgs. Hodgson's Wagtail.

M. Babault obtained a female at Bajaura in May or June. I saw several on the Beas at Bajaura 3,600′ on November 12, 1923.

Motacilla maderaspatensis Gmel. The Large Pied Wagtail.

A resident in small numbers along the Beas from Larji 3,000′ to Katraian 5,000′.

Motacilla cinerea melanope Pall. The Grey Wagtail.

The Grey Wagtail breeds commonly in May and June along the rivers and larger streams of Kulu from 4,000′ upwards to at least 10,000′.

The majority leave the Sub-division in winter but in November and December I have observed a few about up to 5,000′ in the Beas Valley.

Motacilla citreola citreola Pall. The Yellow-headed Wagtail.

Two were seen by the Beas above Manali 6,000′ on May 25, 1921.

Anthus hodgsoni Richmond. The Indian Tree Pipit.

Hume long ago described a single egg of this Pipit taken in Upper Kulu on the snowy range bounding Spiti, about 11,000′ (N. and E. 2nd ed., ii. 209).

M. Babault obtained females at Pulga on May 19, and Tchari-Tjony on June 1, the latter was by the snow line with the organs in breeding condition.

It probably breeds about the summits of all the higher ranges of Kulu as on June 16, 1922. I found several nests with eggs in all stages of incubation on the Jalouri ridge at 9,500–10,500′. These have been described elsewhere.

In November parties appear in the valleys about 4,000–5,000′.

Anthus leucophrys jerdoni (Finsch). The Brown Rock Pipit.

Common in June and July along the valley roads from Bajaura to Larji and Banjar.

Anthus richardi rufulus Vieill. The Indian Pipit.

This plains' Pipit breeds in small numbers in June about the marshy ground of the Beas Valley below Bajaura at 3,500′. It is doubtless a summer visitor only.

Anthus roseatus Hodgs. Hodgson's Rosy Pipit.

In May and June this lovely Pipit breeds commonly about 12,000′–13,000′ along the alpine pastures of the Rhotang Range, and M. Babault found it on similar ground about forest limit above Pulga ; it doubtless breeds along the whole of the highest ranges in northern Kulu. It is one of those birds that are particularly partial to the sodden ground on the edge of melting snow. In winter it is common along the Beas Valley about Sultanpur and Bajaura and there as elsewhere in its winter range is largely a marsh pipit.

Anthus spinoletta blakistoni Swinh. The Altai Water Pipit.

I obtained a specimen from a party in a patch of marshy ground by the Tirthan River below Manglaur 4,000′ on November 17, 1923.

Oreocorys sylvanus (Hodgs.). The Upland Pipit.

Common, at least from May to July, from 3,000′ to 5,500′ in the valley of the Beas and along the Tirthan to Banjar. Hume personally took eggs of this bird in Kulu (N. and E. 2nd ed., ii. 21).

Otocorys alpestris longirostris Moore. The Long-billed Horned Lark.

Kulu is the type locality for this form of Horned Lark and there are 6 specimens from 'Kulu' (without more definite data) in the Gould collection in the British Museum. It is found in summer breeding at 13,000′ on the summit of the Rhotang Pass and as M. Babault procured it also at the end of May at Tchari-Djony one may assume that it breeds along the whole of the Rhotang chain.

Otocorys alpestris elwesi Blanf. Elwes' Horned Lark.

A female labelled 'Kulu' and collected by Hay is in the Gould collection in the British Museum.

Alauda arvensis guttata Brooks. The Kashmir Skylark.

Flocks of this Lark (which breeds in Lahul but not so far as I know in Kulu unless Hume's eggs belonged to this form) are to be found in November and December in the fields of the Beas Valley from Bajaura 3,600′ to Katraian 5,000′. Stoliczka speaks of a Lark which he calls *Alaudula raytal* as a common, winter visitor to Kulu and often caged by the people, but I am not sure what species is indicated.

Zosterops palpebrosa elwesi Stuart Baker. The White-eye.

The White-eye breeds but is not very common in Kulu and Saraj up to a height of about 5,000′ and I have observed it from May until August. It is probably a summer visitor only.

Cyrtostomus asiaticus (Lath.). The Purple Sun-bird.

In June 1922 I saw a few of these Sun-birds in the valley of the Beas between Bajaura and Larji about 3,000–3,500′.

Dicæum ignipectum (Hodgs.). The Fire-breasted Flower Pecker.

Stoliczka states that this beautiful little bird si ' pretty common in Kulu '. I saw a male at some Mistletoe in the garden of Katraian Rest House on December 1 and 2, 1922, and believe that I saw another on November 13, 1923, in the Ban oak forest by the Beas a mile or two above the Outbridge.

Picus squamatus squamatus Vigors. The Scaly-breasted Green Woodpecker.

A common resident in the Kulu and Saraj occurring at least from the bottom of the valleys up to 7,000′ in winter and probably higher in summer. At Manikaran I saw one of these Woodpeckers perch on the side face of a great boulder, but near enough to the top to catch the edge with two front claws.

Picus canus occipitalis Vigors. The Black-naped Green Woodpecker.

On June 26, 1922 I saw three of these woodpeckers together on the bank of the Beas below Manali 6,000′.

Dryobates hyperythrus (Vigs.). The Rufous-bellied Pied Woodpecker.

I saw an adult male on May 17, 1921, at 8,000′ on the northern face of the Bhubhu Pass.

Dryobates himalayensis (Jard. and Selby). The Himalayan Pied Woodpecker.

A common and resident species, but not observed below 6,500′.

Dryobates auriceps (Vigors). The Brown-fronted Pied Woodpecker.

A common and resident species throughout the valleys from Larji 3,000′ up to about 6,000′ and possibly higher.

Liopicus mahrattensis (Lath.). The Yellow-fronted Pied Woodpecker.

M. Babault obtained a female at Ghary in May although this is not a bird which might have been expected to occur in Kulu.

Picumnus innominatus innominatus Burton. The Speckled Piculet.

A pair bred probably annually in the rest house compound at Sultanpur 4,000′, and I saw a single bird below Jari at 5,000′ on November 5, 1923.

Megalaema virens marshallorum Swinhoe. The Great Himalayan Barbet.

In summer this fine Barbet is common in the great forests of Kulu from about 6,000′ upwards ; in November and December I have observed it also at 6,000′ but it doubtless occupies a lower zone during the winter months.

Coracias garrula semenowi Loud. and Tschusi. The Kashmir Roller.

On May 21, 1921, I saw a Roller by the road side just below Raisan 4,800′ on the Beas.

Merops orientalis Lath. The Little Green Bee-eater.

Stoliczka states that this Bee-eater is not uncommon in Southern Kulu from March till the end of October. I have only met with it once, when two were seen in cultivation below Bhuin 4,000′ on November 4, 1923.

Ceryle lugubris guttulata Steg. The Himalayan Pied Kingfisher.

This fine Kingfisher is generally distributed and resident throughout Kulu and Saraj from 3,000′ at Larji up to about 6,000′ on all the rivers and streams. Its large size and handsome black and white plumage and the loud call note 'ping' (similar to one of the calls of the Red-wattled Lapwing) readily attract attention as the bird flies along above the surface of the troubled waters or perches on the trees and boulders that afford handy fishing stations. It occasionally plunges into the water from the wing like the smaller Pied Kingfisher of the plains.

Alcedo atthis (Hasselg.) The Common Kingfisher.

I have observed a few of these Kingfishers along the Beas and Tirthan Rivers up to 6,000′ in May and June ; they doubtless breed here as M. Babault procured a specimen on May 3, with the organs greatly developed.

Halcyon smyrnensis smyrnensis (L.) The White-breasted Kingfisher.

A resident in small numbers along the valley of the Beas nearly up to Manali 6,000′.

Upupa epops epops L. The Hoopoe.

In summer the Hoopoe breeds commonly along the valleys from Larji up to a height of about 8,000′, wherever there is open ground in the vicinity of houses and cultivation. I took c/4 fresh eggs at Sultanpur on May 20 and found several nests with young in June and July, all under the roofs of houses. These birds are summer visitors only, and though an occasional Hoopoe may be seen about the Beas Valley in winter, such birds are probably winter visitors from further north.

Micropus melba (L.). The Alpine Swift.

I have observed this Swift feeding in the Beas Valley about Sultanpur and Katraian in May and June, so it perhaps breeds in some of the ranges.

Micropus apus pekinensis (Swinh.). The Eastern Swift.

On May 21–22, 1921, these Swifts were common along the Beas Valley about Raisan and Katraian. They breed commonly in Lahul.

Micropus pacificus leuconyx (Blyth). Blyth's White-rumped Swift.

On May 21, 1921, I saw these Swifts in company with *M. a. pekinensis* in the Beas Valley about Katraian. Two were seen at Banjar on June 25, 1921. They doubtless breed in the precipices throughout Kulu.

Micropus affinis (Gray). The Common Indian House Swift.

On July 1, 1921, I saw a flight about 5,000′ on the road below Kraon.

Hirundinapus caudacuta nudipes (Hodgs.). The White-necked Spinetail.

On June 16, 1922 with great difficulty I secured a specimen of this Spinetail from a flock which were flying about the crest of the Jalouri Ridge 11,000′ to the east of the Pass. The flight was exceedingly swift and their wings made a very musical sound in the air different to the usual tearing sound made by the wings of fast flying birds.

Collocalia fusciphaga brevirostris (McClell.). The Himalayan Swiftlet.

Flocks of this swiftlet may be seen feeding about the valleys and lesser ranges anywhere in Kulu and Saraj though I have not observed them over 6,000′. My records refer to May, June, July, August, November and December so the species may well be resident.

Caprimulgus sp ? Nightjar.

I have heard Nightjars in the Nagni Nala May 18 and below Shoja on June 15 ; the call was a rapid chuck chuck chuck with the hollow sound of a stone on ice, but I hesitate to identify the species from this alone.

Cuculus canorus L. The Cuckoo.

The Cuckoo is a common summer visitor to Kulu and Saraj occurring from 3,000′ at Larji up to 8,000′ and probably higher. A specimen obtained clearly belongs to the race *C. c. telephonus* Heine but the majority appear to belong to the typical form.

Cuculus poliocephalus poliocephalus Lath. The Small Cuckoo.

I have met with this little Cuckoo in the Beas Valley on two occasions, namely a pair in an alder grove above Manali 6,200′ on May 25, 1921 and below Sultanpur 4,000′ on July 7, 1923. M. Babault however obtained 4 specimens in May and June at Pulga Manikaran and Tchari-Djony.

Cacomantis merulinus passerinus (Vahl.) The Indian Plaintive Cuckoo.

On June 24, 1922, I heard this Cuckoo calling for a long time near Sultanpur Rest House 4,000′, and believe that I also heard it at Banjar 5,000′ on June 12.

Clamator jacobinus (Bodd.). The Pied-crested Cuckoo.

M. Babault obtained a male on 28th June with the organs in breeding condition at the upper edge of the forests at 12,500′ at Rahla by the Rhotang Pass. In June and July this Cuckoo is not uncommon in the lower Beas Valley round about Bajaura and I have also heard it at Banjar 5,500′.

Eudynamis scolopaceus scolopaceus (L.). The Koel.

On June, 22, 1921, I heard a Koel calling in the swamp between Bajaura and Bhuin at 3,800′.

Psittacula eupatria nepalensis (Hodgs.). The Large Indian Paroquet.

M. Babault records that he observed this species in the valley of Kulu in April and May and also obtained a juvenile on the Dulchi Pass.

Psittacula cyanocephala cyanocephala (L.). The Blossom-headed Paroquet.

According to Stoliczka this bird ‘ may occasionally be seen in the southern portions of the Kulu Valley ’.

Psittacula schisticeps schisticeps (Hodgs.). The Slaty-headed Paroquet.

This is the common Paroquet of Kulu and Saraj where it may be found in summer in every valley and on the ridges up to 8,000′ and perhaps higher. It is apparently a resident species.

Strix aluco nivicola Blyth. The Himalayan Wood-owl.

This owl breeds fairly commonly in Kulu from 6,000′ probably up to about 10,000′ and is doubtless a resident species.

Bubo bubo turcomanus (Eversm.). The Great Eagle Owl.

An Eagle Owl was obtained about 12,000′ in Kulu in the summer of 1872 while it was eating a snow partridge on the ground. This bird was recorded by Hume in S. F. I. 315 and named *B. hemachalana* but that is merely a synonym of Eversman's earlier name.

Bubo bubo bengalensis Frankl. The Rock Horned Owl.

Large Owls seen by me in cliffs at Katraian Rest House 5,000′ on June 19, 1921, and on the Kraun Road near Sultanpur 4,000′ on August 7, 1923 were I believe of this species.

Scops plumipes. Scops Owl.

Under this name M. Babault records a male Scops Owl in breeding condition that he obtained at Pulga on May 18.

Glaucidium cuculoides cuculoides (Vigors). The Large Barred Owlet.

This very diurnal species of owl is a common resident in Kulu occurring from the bottom of the valleys to at least 7,500′. On one occasion when marching along the valley road below Manali I came upon an Owlet and a crow fighting desperately in broad daylight on the road for the possession of a disreputable tattered object, which on my nearer approach proved to be a half-grown nestling owlet.

Pandion haliaetus (L.). The Osprey.

In Mr. Donald's list with the remark ‘ Not common ; probably a migrant ; may breed ’. I doubt the last clause.

Ægypius monachus (L.). The Cinereous Vulture.

Included in Mr. Donald's list of birds of Prey in the Gazetteer with the remark ‘ Probably breeds in Kulu ; not very common ’. In my opinion it is in the highest degree unlikely that it has ever bred in Kulu which is too far east of its known breeding range.

Torgos calvus (Scop.). The King Vulture.

In Mr. Donald's list with the remark ' Chiefly found among the Lower hills; nowhere very common '. I saw one on the marsh some 2 miles below Bajaura on June 10, 1922.

Gyps fulvus (Gmel.). The Griffon Vulture.

In Mr. Donald's list with the remark ' Seen near Larji '.

Gyps himalayensis Hume. The Himalayan Vulture.

Fairly common and generally distributed throughout Kulu and Saraj where it breeds in suitable localities.

Gyps tenuirostris Hume. The Himalayan Long-billed Vulture.

In Mr. Donald's list with the remark ' Lower hills, seen near Zakat Khana '.

Pseudogyps bengalensis (Gmel.). The White-backed Vulture.

I saw 3 of these vultures together by the roadside, some 2 miles below Bajaura on November 13, 1923.

Neophron percnopterus (L.) The Egyptian Vulture.

I have observed a few Egyptian Vultures in June at Katraian, Bajaura, Larji and Banjar but they are probably summer visitors only for I saw none in November or December. M. Babault collected a male at Bajaura and a female on the Dulchi Pass and states that they breed in June thereabouts, nesting on cliffs, though in his specimens the organs were not developed. These specimens he identifies as belonging to the race *ginginianus* with the yellow beak, though I should have expected the typical race in Kulu.

Gypaetus barbatus grandis Storr. The Lammergaier.

Stoliczka has recorded the following note (Jour. A.S.B. xxxvii. 1868) :—' The natives of Kulu, about Plash and the Eastern districts prize the meat very highly, which is not only eaten by the low class, the Kolis, but rather more by the higher class, the Kanaits. They generally tie a Chukor on a short string, and stick 4 or 5 sharpened spears in the ground crossing each other, so as partially at least to cover the bird, and at the same time to radiate with their points in different directions. The Eagle is watched from some distance and as soon as it throws itself with its usual great force and velocity upon the prey, it is overpowered with large clubs before it can extricate the spears from its body.'

The Lammergaier is common and resident throughout Kulu and Saraj, and the sight of one or more of these grand birds sweeping round the contours of the hills is a feature of every march. I once saw 4 adults together but it is unusual to see more than a single pair at any time. On one occasion above Manikaran I saw a bird in the dark immature plumage perched on a side bough of a lofty dead tree at the edge of a ravine, but otherwise I have only seen it settle on the ground or on crags and cliffs.

Aquila chrysaetus daphanœ Hodgs. The Golden Eagle.

Mr. Donald's list contains the following statement :—' Resident; lives on crows, foxes, pine martins. Takes Monal and Snow-cock occasionally, but crows are his chief food. Therefore a valuable game preserver.'

The Golden Eagle probably breeds amongst the crags of all the higher ranges in Kulu, but the nest has never been taken in Kulu by any European. I have myself observed the species on the wing by the Bhubhu Pass (9,000′) on October 31, at over 10,000′ at Pulga on November 9, and as below as 6,000′ just below Manikaran on November 10. M. Babault observed it at Tchari-Djoni (end of May) and on the Rhotang Pass on June 29.

Aquila heliaca Savigny. The Imperial Eagle.

In Mr. Donald's list with the remark ' Winter migrant; lives on rats, lizards, carrion.' M. Babault killed a specimen on June 29 on the Rhotang Pass.

Aquila nipalensis nipalensis (Hodg.). The Steppe Eagle.

In Mr. Donald's list with the same remarks as under the last species.

Aquila rapax vindhiana (Frankl.). The Indian Tawny Eagle.

In Mr. Donald's list with the remark 'Not common. Seen in lower valleys. May breed there.'

Aquila clanga Pall. The Large Spotted Eagle.

In Mr. Donald's list with the remark 'Seen near Katraian. Food chiefly frogs and lizards.'

Hieaetus fasciatus (Vieill.). Bonelli's Eagle.

In early November 1923 when in company with Mr. Donald I saw a pair of Bonelli's Eagle frequenting a small cliff two or three miles above Sultanpur on the Kraon road at about 4,500–5,000′. They evidently had an eyrie in this cliff or were intending to nest there. One bird was in the beautiful adult plumage, the other was in a curious phase, pale below uniform brownish above, which at first led us to mistake it for some other species.

Hieraetus pennatus (Gmel.). The Booted Eagle.

'Fairly common probably breeds in the valley. Lives on rats, etc., sometimes takes Chukor. Not very destructive to game.' (Donald).

Ictinaetus malayensis perniger (Hodgs.). The Black Eagle.

Mr. Donald remarks of this species :—'Very rare if known at all in the valley. Mr. Howell's inclusion of this species doubtful.' But in N. and E. 2nd ed., vol. iii. 145, Hume records obtaining a single egg from Kulu with the parent bird taken on January 7.

Spizaetus nipalensis nipalensis (Hodgs.). Hodgson's Hawk-Eagle.

In Mr. Donald's list with the remark 'Resident and probably breeds near Naggar. Very distructive to game.' On December 8, 1922, I saw what was apparently a pair of these Hawk-Eagles chasing a Falcon with booty at a great height across the valley above Katraian.

Circaetus gallicus (Gmel.). The Short-toed Eagle.

In Mr. Donald's list with the remark 'Seen in Saraj near Sutlej river. Food rats, lizards, snakes, etc.'

Butastur teesa (Frank.). The White-eyed Buzzard-Eagle.

In Mr. Donald's list with the remark 'Seen near Bajaura. Probably a wanderer but may be resident. Food, rats, mice, worms, lizards.' In 1921 I saw one above Bajaura on June 22, and 2 or 3 about the marshy ground some 2 miles below Bajaura later on June 23 and 29. M. Babault obtained the young in May or June from a nest at Bajaura.

Haliaetus albicilla (L.). The White-tailed Sea Eagle.

Down as 'a migrant' in Mr. Donald's list. He records (J.B.N.H.S., xxvi. 1071) a supposed example that he saw on the Beas in April 1916.

Polioaetus humilis (Jerd.). The Himalayan Fishing Eagle.

In Mr. Donald's list with the remark 'Resident and probably breeds. Destructive to fish.' He states (J.B.N.H.S., xxvi. 1019) that it is fairly common all over the Kulu Valley. I have seen an occasional eagle in June and July along the Beas from Sultanpur to Manali which were probably of this species but no specimens were procured.

Haliastur indus indus (Bodd.). The Brahminy Kite.

'Not common in the lower valleys near rice fields' (Donald).

I saw a pair opposite to Katraian over the rice fields across the river on July 29, 1922. It is doubtless only a rains visitor as in the Kangra Valley.

Milvus migrans govinda Sykes. The Common Pariah Kite.

The Pariah Kite is not uncommon and probably resident along the Beas Valley from Manali to Larji and up the Tirthan Valley to Banjar, up to a height of about 6,000′.

Milvus lineatus (Gray). The Large Kite.

Hume states in Nests and Eggs 2nd ed., vol. iii. p.176, that he has obtained the eggs of the Larger Kite from Kulu. This species is often difficult to distinguish in the field from the Common Pariah Kite but I possess three specimens collected in Kulu a breeding male from Kraun 5,000′ July 1, 1921, a nestling from a nest at Bajaura 3,600′ June 8, 1922, and an immature male from Katraian 5,000′ December 9, 1922, and believe that I have seen others occasionally along the valley from Naggar to Bajaura in the summer months. A Kite seen at 12,000 feet on the Rhotang Pass on May 26, 1921, was most probably of this species.

Elanus cæruleus cæruleus (Desf.) The Black-winged Kite.

In Mr. Donald's list with the remark 'A migrant. Lives on insects.'

Circus cyaneus (L.). The Hen-Harrier.

'A migrant; fairly common in autumn and spring' (Donald).

M. Babault obtained a female in May at Bajaura with the organs developed but he was I think wrong in drawing the conclusion that this bird was on its breeding ground.

(I saw some species of Harrier in the ring-tail plumage at Pulga 7,000′ on November 8, 1923, quartering the fields in front of the Rest House.)

Circus æruginosus (L.). The Marsh-Harrier.

'A migrant; fairly common in autumn and spring' (Donald).

M. Babault obtained 2 males at Bajaura on June 13, with the organs developed.

Buteo buteo japonicus (T. & S.). The Himalayan Buzzard.

In November and December I have met what I believe to be the Upland Buzzard occasionally along the bottom of the Parbatti and Beas Valleys but it is not found there during the summer months, and is then probably breeding in the higher ranges. The whole question of the forms of Buzzard that occur in Kulu and their status requires careful examination.

Buteo ferox (S.G. Gmel.). The Long-legged Buzzard.

Buzzards, probably both of this species and the last, are common in the valleys in winter, and some of them appear to breed on the ranges. Hume states (N. & E. 2nd ed., iii. 125) that typical *ferox* breeds in Kulu and that he possessed an egg with the skin of the parent obtained on January 10.

The race *B. f. hemilasius* Temm. & Sch., also occurs in Kulu as a skin obtained by Hume and made the type of his *Archibuteo leucoptera* (S.F.I. 318) is in the British Museum.

Astur gentilis (Linneus). The Goshawk.

There is very little definite information on record about the Goshawk which probably breeds in the higher forests of Kulu. Certain it is that several are netted annually on the ranges of the Parbatti Valley and Saraj and taken down into India for sale to Falconers.

On December 10, 1922, at Bhuin I met a man with an adult male and two immature females tied to a pole, hooded and with the tails sewn up in cloth according to custom, and he stated that they had been caught in Saraj a week or two earlier.

A bird seen by me in the distance about 10,000 ft. above Pulga, on November 9, 1923 was perhaps an adult Goshawk.

Astur badius dussumieri (Temm.). The Shikra.

'Common: resident and breeds' (Donald).

I shot a fine male in an alder grove (4,000 ft.) just above Sultanpur on May 21, 1921.

Accipiter nisus (L.). The Sparrow-hawk.

'Common; resident and breeds' (Donald).

I have seen an occasional *Accipiter* in Kulu but usually under circumstances that did not allow me to be sure of the exact species: the majority were probably this bird. M. Babault obtained a pair at Tchari-Djony at the end of May and states that he found nests in the forests in this locality.

Accipiter virgatus affinis (J. E. Gray). The Besra Hawk.

'Probably resident and breeds. Nowhere common' (Donald).

Stoliczka on the other hand (J. A. S. B. xxxvii) states that the Besra is far more common than the Sparrow-hawk in the Kulu Valley. I obtained a female at Manali (6,000′) on August 4, 1923.

Falco peregrinus L. The Peregrine Falcon.

'A winter migrant' is the remark in Mr. Donald's list.

Falco peregrinus peregrinator Sund. The Shahin.

'Resident and probably breeds. Destructive to small game such as partridges, chukor, etc.' (Donald). I have seen single Falcons above Manali (6,200′) on June 17, 1921 and above Katraian (6,000′) on December 8, 1922, which were probably of this species. I also have seen an undoubted pair of Shahins at Larji (3,000′) on November 18, 1923, when they were bullying an Eagle on the hillside in front of the Rest House.

Hume records (N. and E. 2nd ed., iii. 186) that he possessed an egg taken near Deet in Kulu on February 6, and two eggs taken near Nitta in Kulu on February 3.

Falco severus indicus (Meyer & Wiglls.). The Indian Hobby.

Donald states that it is 'Resident and probably breeds', while Stoliczka says (J. A. S. B. xxxvii) that is not common in Kulu. These statements appear to me to require verification, as I am of opinion that this Hobby has not such a wide range as is usually attributed to it.

Falco subbuteo subbuteo (L.). The Hobby.

I shot a fine adult male Hobby on July 28, 1922, at 9,000′ at the mouth of the Humpta Nala, and another adult male on the summit of the Rhotang Pass 13,000′ on July 12, 1923. A Falcon seen at 7,000′ in the pine forest above Manali on the Kothi Road on August 4, 1923, was almost certainly also of this species. M. Babault obtained a pair in breeding condition at Pulga on May 19.

Falco tinnunculus interstinctus Mc Cl. The Kestrel.

During the summer the Kestrel is exceedingly common throughout Kulu from the bottom of the valley up to heights of 10,000 and 12,000′. A pair seem to breed in every rocky cliff of importance and many pairs also breed in the conglomerate cliffs of earth and boulders which represent the remains of the old bed of the valley. During the winter the species is distinctly less common and at this season many birds doubtless leave Kulu and winter in the plains. These little Falcons are very quarrelsome and the approach of any larger bird of pair to their eyries is the signal for a great display of temper, the intruder being mobbed with an incessant petulant screaming note.

M. Babault found 4 feathered young in a nest at Rahla on June 24.

The typical race may be expected as a winter visitor and passage migrant through Kulu.

Sphenocercus sphenurus (Vigors). The Kokla Green Pigeon.

The Kokla Green Pigeon is a very common summer visitor to Kulu and Saraj occurring in all the valleys up to at least 6,000′ and doubtless higher. Stoliczka notes that it is very fond of Mulberry fruit and it is distinctly partial to elms and alder trees.

Columba livia subsp ? The Blue Rock-Pigeon.

The Blue Rock Pigeon breeds very commonly in the rocky gorges and precipices throughout Kulu and Saraj up to a height of at least 10,000′. It is a resident species but some of the flocks which feed in cultivation in the valleys during the winter months may be immigrants.

Columba rupestris Pallas. The Hill Blue Rock-Pigeon.

M. Babault met with this species at Tchari-Djony. It is of course common in Spiti.

Columba leuconota (Vigors). The Snow Pigeon.

M. Babault met with the Snow Pigeon at Tchari-Djony. In May and June I have met with a few on the southern slopes of the Rhotang Pass, usually over 10,000′ though I have seen it as low as 8,500′ below Rahla. There is a specimen from Kulu dated February in the Gould collection.

Streptopelia orientalis meena (Sykes). The Indian Rufous Turtle Dove.

The Turtle Dove is a common summer visitor to Kulu and Saraj occurring at all heights during the passage but probably not breeding below 6,000′.

Streptopelia chinenses suratensis (Gmel.). The Spotted Dove.

The Spotted Dove breeds commonly in the valleys of Kulu and Saraj up to about 6,000′ at Juggatsukh. On June 20, I found a nest placed on the rafters of the rest house verandah at Bajaura. It is probably a summer visitor only.

Streptopelia senegalensis cambayensis (Gmel.). The Little Brown Dove.

M. Babault obtained two females at Ghary on May 8, and a male at Bajaura.

Streptopella decaocto decaocto (Friv.). The Indian Ring Dove.

A common Summer visitor to the valley of the Beas from Larji 3,000′ to Manali 6,000′, but less numerous above Sultanpur.

Catreus wallichii (Hardw.). The Cheer Pheasant.

Hume records taking a nest with 4 eggs early in May a few miles from Jaggat sukh (N. and E. 2nd ed., vol. iii, 413). My own collection contains 5 eggs which were brought in fresh to me from the neighbourhood of Katraian in May. The eggs of this pheasant however continue to be sufficiently rare in collections.

The Cheer Pheasant is apparently found throughout Kulu and Saraj at moderate elevations above 5,000′ but as elsewhere in its range it is sparsely distributed and very local. According to Tyacke (Manual Rev. ed. 1907) the best locality for it in Kulu from the sportsman's point of view is the Dobi Nala. M. Babault collected specimens on the Dulchi Pass. Personally I only met with it in Kulu in the Parbatti Valley at Kasol on open dry grassy slopes amongst scattered cheel trees. It has no seasonal altitudinal movement.

Pucrasia macrolopha (Less.). The Koklas Pheasant.

The Koklas Pheasant is common in Kulu and Saraj in the middle zone of forests from about 7,000 to 9,500′.

Gennæus hamiltoni (Griff.). The White-crested Kalij Pheasant.

This is the common pheasant of Kulu and Saraj and it is very generally distributed at all heights from 4,500′ up to 8,000′, being especially partial to heavy undergrowth in the neighbourhood of water.

Lophophorus impejanus (Lath.). The Monal.

The numbers of the Monal Pheasant are periodically reduced by netting and snaring in those areas where the slackness or venality of the local subordinate officials encourages the poaching instincts of the Kulu villager ; for this pheasant besides affording a welcome dish is considered peculiarly appropriate to form a ' Dali ' ; while the plumage of the male—and more especially the long crest feathers, has a certain monetary value. When poaching is reduced to the minimum the Monal is common in all the forests of the higher ranges from 8,000 to 12,000′; with the descent of the snowline in winter the birds collect in the lower portion of their range and then excellent sport may be obtained by the sportsman who is sound enough in wind and limb to undergo the necessary climbing. I know no finer sport ; unrivalled air and scenery, the magnificence of the quarry, the difficulty of the climbing and shooting and the immense satisfaction as each bird is gathered in to the bag, all combine to afford a day's sport which is seldom equalled and never surpassed in the annals of the shot gun. But the bag is invariably small. Personally I have never killed more than six Monal in one day though other pheasants may also be obtained to swell the bag.

Tragopan melanocephalus (Gray). The Western Tragopan.

The Tragopan is the rarest of the pheasants of Kulu but it may be found in small numbers here and there on the high ranges at the same elevations as the Monal and also slightly lower in winter. It is more of a skulker and is usually found in thick undergrowth, Rhue or light Ringal Bamboo growth. The eggs are very rare in collections but I obtained 4 rather incubated eggs from Saraj in May 1928 through a village headman,

Coturnix coturnix coturnix (L.). The Quail:

Stoliczka states that the Quail may occasionally be obtained in the Kulu Valley between 4,000′ and 5,000′ ; Kulu is however outside the main migration route of the species.

Arboricola torqueola millardi *SB.* The Simla Hill Partridge.

I have heard the call of this partridge not infrequently about the summit of the Dulchi Pass and Tyacke states (Manual Rev. ed. 43) that this is the only spot in the Kulu Valley where it is to be found.

Alectoris graeca chukar (Gray). The Chukor.

This splendid game bird may be found throughout Kulu and Saraj wherever the absence of forests provides the necessary open ground, though the stonier and more barren the slopes the greater the likelihood of obtaining sport. At one time good bags were procured, the best that I have heard of being over 40 brace, but of late their numbers have been reduced by poaching. The Chukor is a favourite cage bird in Kulu and numbers are taken thence into the outer hills.

Francolinus francolinus asiœ Bonap. The Black Partridge.

The Black Partridge is found in small numbers in the valley of the Beas from Raisan to Larji, in the Kraun Valley, and up the Tirthan to Banjar at heights up to 6,000′. It is however fairly common only in the open cultivated valley about Bhuin and Bajaura.

Tetraogallus himalayensis (Gray). The Snow Cock

There are several specimens from Kulu in the Hume Collection but the only definite locality specified is the Jalouri Range (January–February). Stoliczka states that it is found in Northern Kulu. I have no personal knowledge of the bird in Kulu or Saraj but M. Babault met with it at Tchari-Djony. It is probably common enough on some of the highest ranges.

Lerwa lerwa (Hodgs.). The Snow Partridge.

Stoliczka states that the Snow Partridge 'is numerous in the north-western parts of Kulu during the winter, when it descends from the snowy ranges somewhat lower down'. In the Hume collection there are 8 specimens collected in January and February on the Jalouri range, and two from Nunda in February. M. Babault met with it at Tchari-Djony at the end of May. I received a specimen in the flesh which had been obtained somewhere in Saraj and Mr. Shuttleworth, I.C.S. (once Sub-Divisional Officer of Kulu) informed me that he shot a single bird from a covey in February, 1919 on the hump of the Rhotang Pass above Rahla at about 9,500–10,000′. More definite information about this bird is greatly to be desired, as its numbers appear to be diminishing throughout the Western Himalayas.

Amaurornis fuscus (L.). The Ruddy Crake.

M. Babault found it in small parties in the Bajaura marsh on June 13 and secured a male. I obtained a male (with the organs partly developed) on June 30, 1921, at Sultanpur 4,000′ in the alder-grove between the town and the Tehsil.

Lobivanellus indicus indicus (Bodd.). The Red-wattled Lapwing.

The Red-wattled Lapwing is fairly common in summer along the valley of the Beas from Manali 6,000′ to Larji 3,000′. I fancy the majority of these birds are only summer visitors as with the exception of a party of 4 seen at Bajaura on November 12, 1923. I have seen none in winter.

Charadrius dubius jerdoni (Legge). The Little Ringed Plover.

On June 8 and 9, 1922, I found a couple of pairs of Ring Plover which were clearly nesting on the shingle banks of the Beas at Bajaura 3,600′ M. Babault obtained a pair in June in the same locality and also notes that the species was in parties, probably I suppose family parties.

Ibidoryhynchus struthersii Vigors. The Ibis-Bill.

One or two pairs of this beautiful and interesting bird are resident in the valley of the Beas and breed on the shingle beds of the river but I think it desirable to suppress the exact locality.

Tringa hypoleuca (L.). The Common Sandpiper.

The Common Sandpiper may be found here and there on the rivers of Kulu any time in the year, though but rarely in summer. I have no evidence that it ever breeds in the country, and it is hardly likely to do so as in Lahul I did not find it breeding anywhere nearer than Jispar.

Tringa ochropus (L.). The Green Sandpiper.

Not uncommon as a winter visitor and non-breeding individuals are also to be met with in summer, along the valley of the Beas.

Tringa totanus (L.). The Redshank.

On June 8, 1922, I saw a Redshank on the shingle of the R. Beas at Bajaura 3,600′.

Scolopax rusticola (L.). The Woodcock.

The Woodcock must breed fairly commonly in all the larger valleys of Kulu about 8,000′ to 10,000′. In winter the birds descend to lower levels and after snow has fallen on the ranges they are found in the ' mahals ', the alder groves mixed with swamp and bush undergrowth, along the Beas and presumably the Parbatti and other valleys. Unfortunately there is practically nothing on record about the woodcock in this, one of its most noted habitats in India, and details are most desirable as regards the elevations and nullahs in which the bird has been met in the breeding season, its seasonal altitudinal movements, and the sport that it has afforded in winter.

Capella nemoricola (Hodgs.). The Wood-Snipe.

M. Babault obtained two males with the organs developed at Tcho-ti on the River Tcho at the end of May so it doubtless breeds in the vicinity. Details about the bird are sadly wanting.

Capella solitaria (Hodgs.). The Solitary Snipe.

On November 9, 1923, I flushed a solitary snipe form a small half-frozen stream at 9,000′, above Pulga; this was at the edge of a small open ' Tharch ' in Silver Fir forest. A few days later on November 17, I shot one from the boulder strewn nala by the Manglaur bridge 4,000′.

Capella stenura (Kuhl.). The Pintail Snipe.

There is a specimen from Kulu collected by Major Hay in the Gould collection in the British Museum.

Capella gallinago (L.). The Fantail Snipe.

Stoliczka says that the snipe has been obtained in Southern Kulu in winter.

Phalacrocorax carbo (L.). The Common Cormorant.

A cormorant, presumably of this species, occurs in Kulu though it apparently does not breed in the country. I have seen a few on the Beas from Bhuin to Larji in June and November, and one in November on the Tirthan below Manglaur.

Anser anser (L.). The Grey Lag Goose.

Occurs in the list of Game birds given in the Gazetteer.

Anser indicius (Lath.). The Bar-headed Goose.

Occurs in the list of Game birds given in the Gazetteer.

Nettopus coromandelianus (Gm.) The Cotton Teal.

Occurs in the Gazetteer list.

Anas pœcilorhyncha pœcilorhyncha Forst. The Spot-bill Duck.

Occurs in the Gazetteer list.

Anas platyrhyncha (L.). The Mallard.

A few were observed in the first half of November on the Beas about Bhuin and Bajaura and on the Tirthan at Manglaur.

A few pairs are said to breed at the little marsh at Dalogi 7,000 feet in the Sainj Valley but the statement has not been verified.

Nettion crecca (L.). The Common Teal.

A very big flock of Teal was observed feeding on water-logged cultivation at Bhuin on November 4.

Querquedula querquedula (L.). The Garganey.

Occurs in the Gazetteer list.

Mareca penelope (L.). The Wigeon.

A small party were observed on the Beas at Bajaura on November 12.

Chaulelasmus streperus (L.). The Gadwall.

A few parties were seen on the Beas from Bajaura to Larji during the first half of November.

Spatula clypeata (L.). The Shoveller.

Two or three were seen at Bajaura and Oot on November 12 and 16.

Marmaronetta angustirostris (Mên.). The Marbled Duck.

Netta rufina (Pall.). The Red-crested Pochard.

Nyroca ferina (L.). The Pochard.

Nyroca rufa (L.). The White-eyed Pochard.

Nyroca fuligula (L.). The Tufted Duck.

The names of these 5 ducks all occur in the list in the Gazetteer.

LADY [ELIZABETH] GWILLIM,

Artist and Ornithologist

BY

CASEY A. WOOD, M.D., M.B.O.U.

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For several years past I have been buying books, manuscripts, paintings, and other items for the Blacker Library of Zoology and for the E.S.W. Library of Ornithology, McGill University, Montreal, Canada. This search for literary material in zoology has finally narrowed itself to rare *desiderata,* the ordinary requirements of these special collections having long been satisfied; consequently, the quest has led me into out-of-the-way localities and into shops and other marts of trade not generally regarded as harbouring works of zoological interest. While following this plan last year I, at a venture, enquired of a small but select London dealer in *objects d'art* whether he had any drawings or paintings of birds or other animals. After a search in his cellar among much half-forgotten stock, he brought out a parcel containing about thirty small (10 × 14 in.) mounted and coloured drawings of Indian Fishes. Each mat bore an auctioneer's (or dealer's) printed number; a few were signed 'E.G.,' and upon still more were written legends (that Sir Henry Drake-Brockman later translated for me as Urdu) of the native names of the subjects portrayed. With the contents of this package I was shown a portfolio containing paintings in colour of a few Indian flowers, inscribed with both their English and systematic names. Pasted on one of the front pages of this portfolio was a leaf on which was written 'Elizabeth Gwillim, Madras, 1800-1806.' While I was examining these drawings and asking for more, a salesman happened along and said to the proprietor, 'I think that before I went to France in 1914 I saw a collection of bird paintings downstairs.' Shortly afterwards this clerk appeared bearing an immense, dust-laden, but extremely well made portfolio about five feet broad and four high. I noticed that it was brass-bound, provided with a safety lock and had a wide wooden back. It must have weighed thirty pounds. On it were painted barely decipherable initials and a date—'E.C.K. 1800.' The contents amazed and delighted me. I do not claim to be an art expert, but I realized at once that the paintings of Indian birds in the pockets of that giant container were by the hand of no mean draughtsman.

We are all well acquainted with the productions of brush and pencil wielded by 'ladies of quality' during the Georgian and early Victorian periods, and I fully expected to find these amateurish efforts displayed in the bird drawings, despite the rather favourable impressions made on me by the fishes and flowers. But I was agreeably mistaken; not only were the birds—so far as I then knew them—faithfully depicted as to plumage and posture, but the backgrounds were painted in a fashion worthy of Keulemans or Grönvold. They were in water colour, carefully finished and on fine paper. Some of them were mounted, and all were numbered in the handwriting of the artist. Many bore (on the backs mostly) descriptive notes—measurements, colour-indications, and other data. Generally the systematic title, sometimes only the English or vernacular name, was appended. On some pictures there was no legend; on others only the genus was given. In addition to the completed drawings there was a small collection of unfinished sketches, evidently the usual 'studies' of the artist.

Some of the paintings bore faint, but elaborate, pencilled descriptions of the bird-subject, references to its habitat, life-history, nesting-habits, oology, food, sexual differences, etc., showing that the artist was, for her day and generation, a well-informed zoologist.

In every instance an appropriate background—Indian landscape, trees, shrubs, on which the particular bird was accustomed to roost, flowers, fruit or animal food on which it fed—was provided.

In addition to notations by the hand of the artist herself, the reverse of each portrait showed, as in the case of the drawings of the Indian fishes, a trade number, as if the collection had been prepared for public sale or auction.

After I had acquired this rather remarkable 'find,' I naturally tried to trace the paintings to their original source, but in vain. All the dealers could tell me was that they were purchased by them 'at a sale in the country' many years before, but exactly when and where they could not remember, and were unable to discover, as no record of the sale had been preserved. From time to time the portfolio had been resurrected and an occasional picture sold, mostly for framing but sometimes for decorating fire- and other screens! It was impossible to say who bought these odd lots.

I carefully cleaned the Gwillim pictures of their century of dust and other accumulations, and was much pleased to find that, chiefly owing to the fine quality of the drawing paper, there was very little 'foxing' visible, and that the well-constructed portfolio had further preserved them. The colours (including the iridescence of certain plumage) were barely altered; many a brilliant hackle, mantle, wing, and tail seem as freshly depicted as when they were painted more than a hundred years ago.

In all there were 121 drawings, and as the highest of Lady Gwillim's numbers was 201 (corresponding to 180 of the supposed dealer) it may be assumed that she had at one time and another painted at least the former number of bird-portraits, which before they fell into the hands of the former dealer had probably been reduced by sale or otherwise to 180.

The 121 pictures give one a fair idea of the avifauna—indigenous and migrant—of southern India. Comparing them with Jerdon's list and with the fuller catalogues of Blanford and Oates, there are, of course, many gaps—many genera are not represented at all; but, considering the circumstances, one can easily believe that if the artist had lived a few years longer she would have made a gallery of Indian bird-pictures of the greatest scientific value, worthy to rank with the major collections of the world. Her sudden and early death, however, prevented the completion of the task, and probably consigned many of her best efforts to oblivion.

The importance of the collection may warrant a few remarks about individual pictures, as well as about the artist herself.

In the first place, almost all the drawings are life-size. If one reflects for a moment that Indian birds include many of the largest of the Old World avifauna, the reason for the immense portfolio I have described is manifest. For example, the painting of *Ardea cinerea* measures, exclusive of the mount, $33\frac{3}{4}$ in. × 24 in. ; of *Dissura episcopus,* $25\frac{1}{2}$ in. × 24 in. ; *Herodias alba,* $26\frac{1}{4}$ in. × 20 in. ; *Ardea manillensis,* $26\frac{1}{4}$ in. × $19\frac{7}{8}$ in. ; *Botaurus stellaris,* 30 in. × $24\frac{1}{2}$ in. ; *Pseudotantalus leucocephalus,* 25 in. × $21\frac{1}{4}$ in. ; *Gallus sonnerati,* $33\frac{1}{2}$ in.

The Accipitres are well represented and proportionately figured; even the largest Vultures are painted life-size.

It has been the proud belief of Americans—myself included—that it was our Audubon who first produced full-length portraits of the largest birds, and certainly the pictures of the male and female Wild Turkey, of Washington's Eagle, etc., and their exact reproduction in the elephant folio bear out that claim. However, so far as originals are concerned, we must now concede the palm to Lady Gwillim, who, so far as I know, is the first artist-ornithologist to paint full-sized and exact pictures of any considerable number of birds whose length exceeds, say, 35 inches.

I asked a number of trained ornithologists to examine and give me their opinion of the scientific and artistic value of the collections, among them Mr. Stuart Baker and Mr. Kirke Swann. The latter carefully revised the systematic names of the Birds of Prey, and expressed his complete satisfaction with the manner in which they had been depicted by the artist. Mr. W. L. Sclater also kindly looked over the portfolio and agreed that its contents would be of distinct value to students and would form a desirable addition to a research library. He pointed out that in the evident faithful delineation of *living* subjects the pictures formed a striking contrast to those common but really valueless drawings supplied by native artists of Indian birds. Moreover, they were likely to be free of those errors (discoloured and faded wattles, legs, ceres, mandibles, etc.) sometimes made by even our best artists who were obliged to make their drawings from bird-skins in which decided colour-changes had occurred after death. Lady Gwillim, having been in a position to command live birds or recently killed specimens, had been able to avoid such mistakes.

Having settled the status of her pictures, it remained to find out something about the artist. I have consulted all the ordinary and most of the extraordinary sources of information that would occur to one interested in the matter, but with meagre results. Many authorities—among them Sir Henry Drake-Brockman (I.C.S.), Sir William Foster of the India Office, Canon Bannister, the well-known genealogist of Hereford, whence Lady Gwillim's husband came to Madras, the Librarian of the Inner Temple, and several others, who seemed likely to furnish some account of her life and career as the wife of a distinguished Indian judge—very kindly assisted me in this quest. In addition, I have carefully searched all the biographies, both British and Indian, at my command and have diligently explored, while in that city, all the Madras public libraries, including the files of the *Madras Government Gazette* and the records in the Connemara Library at Madras. Through the courtesy of the Garrison Chaplain, the Rev. C. E. De la Bere, I was permitted to examine the Parish registers of St. Mary's Church and to copy the inscription on Lady Gwillim's tomb. I regret to say that the information thus acquired is small in amount and of disappointing character. The *Government Gazette,* the only newspaper published in the Presidency at the time, gives only the usual formal notice of the lady's death, omitting her maiden name, and birth-place. As Sir W. Foster remarks, obituaries of women of title were not fashionable at the beginning of the nineteenth century.

Briefly, all vital data I have been able to secure up to the present time is as follows :—Elizabeth (maiden name unknown) Gwillim was born (about) April 21, 1763, and came to Madras in the year 1800 with her husband, Sir Henry Gwillim (just made K.C.M.G.) of Hereford, one of His Majesty's Puisne Justices of the newly-formed Supreme Court of Judicature. She died Dec. 21, 1807,* at the early age of 44, and was buried in St. Mary's Church, Fort St. George, Madras. Cut in the pavement of this historic church, near the front entrance, is this inscription :—

ELIZABETHA

PIA CONIUX

HENRICI GWILLIM EQ. AUR.

VIXIT ANN. XLIV. MENSES VIII

H. S. E.

MDCCCVII.

If any of my readers can add to the life-dates or personal history of this half-forgotten artist, the information will be gladly welcomed by the present writer.

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*In both Mrs. F. Penny's *Fort St. George, Madras* and C. S. Cotton's *Monuments of Madras* this date is incorrectly given as August 7, 1807.

SOME NOTES ON THE SECOND EDITION OF THE FAUNA OF BRITISH INDIA—BIRDS, VOLS. I AND II

BY

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VOL. I

Excellent as was the Fauna of Oates and Blanford—and few will deny the great help it has been to those of us in India who were ' ornithologically inclined ', a new edition in light of the extended knowledge of the last 30 years was urgently required. To write such an Avifauna within the limits prescribed covering the whole of India (in the widest political sense) and dealing with every aspect of each species fully, is an Herculean—nay almost impossible—task for any one man. Only those who have studied the subject at all deeply can realize what an immense amount of work in the museum and library such a work entails. It will follow therefore of necessity that those who have specialized at all in any one department or region will find in the new edition of the Fauna statements which are not strictly accurate when applied to their speciality, and here and there they will find errors or slips have unaccountably crept in. Mindful of these facts and of Mr. Baker's request (vol. xxx, 207–9) for helpful criticisms, I venture to put on paper these few notes which I have jotted down chiefly concerning N.W. Indian birds on reading through the *Fauna*—not that they pretend to be exhaustive—avoiding as far as possible any matters of opinion or subsequent publication. For convenience of reference I have copied the nomenclature used in the Fauna.

p. 21. Raven (*Corvus corax laurencei*). I cannot confirm the statement that the Brown-necked Raven replaces this bird in N.E. Sind. There are very few certain records of *ruficollis* in Sind.

p. 34. Sind House Crow (*Corvus splendens zugmayeri*). The distribution given of this bird is too wide to the west. In Beluchistan it is practically confined to Las Belas and Sibi plains. Zarudny did not meet with it in Persian Beluchistan nor has any one else met with it there or in the Mekran, so far as I am aware. Nor does it enter the hills to any extent. If it occurs at Fao in Iraq at all, it must have been introduced there ; there is no recent record. On the other hand it is the form of House Crow over the greater part of the western Punjab plain, but to Afghanistan it must indeed be a straggler or occur in places just on the border. It must be remembered that old records of ' Afghanistan ' (such as Griffiths') did not refer to Afghanistan of to-day necessarily but often to Beluchistan (Sibi) or even Upper Sind.

p. 31. Rook (*Corvus frugilegus tschusii*). The Rook does more than occasionally wander to the Punjab plains. It is a regular winter visitor to the plain north of the Salt Range and occurs at Gujranwala, Ludhiana and near Lahore—as recorded by Whistler and Currie. Punjab specimens which I have examined cannot be picked out in any way from the typical race.

p. 29. Himalayan Jungle Crow (*Corvus coronoides intermedius*). It is difficult to see how small birds at Murree can be wanderers from the plains after breeding. No Jungle Crow breeds in the Western Punjab plains and the species is practically absent from Sind. The distribution of *levaillanti* therefore also needs emendation.

p. 38. Kashmir Magpie (*Pica pica bactriana*). It must surely be a straggler to the Simla Hills ; at all events no one has met with it there of recent years.

p. 48. Indian Tree Pie (*Dendrocitta rufa*). I have already gone so fully (Ibis. 1922, p. 537) into the races of this bird that I will only say that if any races are to be recognized at all it is surely inconsistent to unite the largest and paler north-western bird (*pallida*) (W 152–170), with the smallest and darker

South Indian bird *rufa* (W 135–152). *Sclateri* and *kinneari* do not appear to me to be very distinct forms.

p. 70. Yellow-billed Chough (*Pyrrhocorax graculus*). The Himalayan bird of which Whistler has obtained a splendid series run much larger than European ones ♂ W 275–298, bill from base 35–38. ♀ W 262–266, bill 34–35. It should, at any rate for the time being, stand as *forsythi*.

pp. 73–77. Grey Tits (*Parus cinereus*, etc.). The Great Tit of Southern Persia *P. major blanfordi* belongs most distinctly to the *major* and not the *cinereus* group. I am unaware of any of the *cinereus* group in N. Arabia.

P. m. intermedius. The measurements given are too small for Baluchi birds, males of which measure W 73–78 T. 63–72. It is a large-winged bird *with tail in proportion* ; some of mine have not fully grown tails so that 63 mm. is probably on the small side.

P. m. planorum. This supposed race wants further examination. I have examined the type, it is an unsexed winter bird with no original label, said to have come from 'South Punjab'! The wing measures 70 mm. It and another apparently from the same source (W 68) I cannot distinguish from *kaschmirensis*. No Grey Tit breeds in the plains of the Punjab, except perhaps on the Delhi side, nor in Sind.

A useful distinction in the various races of Grey Tit is the white wedge on the penultimate tail feather's inner web. This varies in depth in birds from the type localities pretty constantly.

In *cinereus*	10–20	mm.	up from tip ;	outer web	black.
In *mahrattarum*	20–28	,,	,,	,,	with a black line.
In *kaschmiriensis*	30–40	,,	,,	,,	no black line.
In *intermedius*	37–40	,,	,,	,,	,, ,,

p. 82. Turkestan Marsh Tit. (*Parus palustris korejewi*). I can find no record of this bird in Beluchistan. I think that it would have been more helpful if, in all cases of very rare stragglers, the records had been given in full.

p. 85. Simla Black-Tit. (*Lophophanes rufonuchalis rufonuchalis*). The English name of this bird only has priority to recommend it, it being given by Jerdon. But it must be very confusing to the inexpert. This Tit does not occur actually in Simla, nor is the type locality Simla. Blyth says 'Tyne range beyond Simla presented by Capt. Hutton.' Stewart (*Zool.* 1886 p. 443) says he gave Hutton this bird and he procured it at Nagteeba two long marches beyond Landour though the date he gives (1861) must have been a slip. In the description it is said that there is a broad band *down the abdomen* 'black,' and the upper plumage is olive *green* ; both these statements are copied from the Fauna ed.; and are misleading ; if there is a broad black band as stated it must be rare as none of our large series have it, and olive green must have been a slip for olive *grey*.

p. 98. White-Cheeked Tit. (*Ægithaliscus leucogenys*). A reference is made to Whitehead obtaining this bird as low as 1,800 feet at Safed Koh on July 20. This *is* as recorded by Whitehead, but it is an obvious misprint or slip for 8,000 ft., and as such is nothing noteworthy. The Safed Koh being one of the highest mountains on the Frontier, no part of it of course is anything like so low as 1,800 ft.

p. 100. Penduline Tit. (*Remiz coronatus*). I know of no record in British Beluchistan of this species ; Whitehead and Magrath obtained it in Kohat District, N.W.F.P.

p. 133. Velvet-fronted Nuthatch (*Sitta frontalis*). The distribution is given as the whole of India west of Bombay, Gwalior and Kumaon ; it should of course be *east* of this line. The Himalayan bird is smaller than the Ceylon bird in wing and bill, and should stand as *Sitta frontalis corallina* Hodgson (J.A.S.B.V., p. 779. 1836 Nepal), Ceylon birds measure W 75–84. Nepal and Sikkim, W 71·5–77.

p. 199. Afghan Babbler (*Argya caudata huttoni*). The 'Jay River Hills' in Sind is the Gaj Nai, a hill water course in the Khirthar N.W. of the Munchar Lake. I too made the mistake (Ibis, 1922, p. 540) of uniting *eclipes* with *Argya* *caudata caudata* ; it is perfectly distinct and an interesting form. It is rather larger than *caudata* and much darker on the upper parts with larger streakings. Since I wrote (*loc. cit*) I have seen a good series from Rawalpindi, Peshawar (type) Attock and Kashmir foothills (Punch-Gingri road). It is the race inhabiting the lower hills in the N.W. corner of India. Hume's original description is good. The status of this race seems to be on a par with that of *Molpastes leucogenys humii.*

p. 357. Grey Hypocolius (*Hypocolius ampelinus*). The distribution of this bird is still not completely known. It certainly is a summer visitor to Iraq, but Mr. Baker appears to suggest that it is resident in Persia moving south in spring ; I know of no support for this.

pp. 383–389. Red-vented Bulbuls. (*Molpastes hæmorrhous*). The measurements given for the various races will need revision, and it may be noted that Bulbuls vary in size according to sex and so it would have been better to have given the measurements for each sex. The wing measurement of *pallidus* is given as 87–97 ; I measure a large series—♂ 96–101, ♀ 89–94·5. It is not clear from the distribution given that this bird occurs in S. E. Sind and in the plains of the Western Punjab. The measurements of *bengalensis* is given as 103–111 ; the few I have from Bengal measure 3 ♂ ♂, 101·5–104·5, 4 ♀ ♀ 93–99. *Intermedius* is given as '92–105, very few reach 100.' I measure 8 ♂ ♂. (100·5) 102·5–106, 7 ♀ ♀ (92), 98–102 ! In passing it may be noted that the description of *M. h. nigropileus* has been omitted.

p. 390. White-eared Bulbul (*Molpastes leucogenys leucotis*). The tpye locality cannot be restricted to the Punjab as it has already (J. B. N. H. S., xxviii, p. 271, March 1922) been restricted to Karachi in Sind. The measurements given (W 86–93) surely include the Perso-Iraq form *mesopotamiæ* ; not one out of our 17 specimens (Sind and Punjab) exceeds 88. ♂ 81·5–88.

p. 394. Bengal Red-whiskered Bulbul (*Otocompsa emeria emeria*). This must be very rare at Simla ; no one appears to have recently come across it though Simla is given in the first edition of the *Fauna* as within its range.

p. 422. Small Olive Bulbul (*Pycnonotus erythropthalmus*). The distribution is omitted.

p. 423. Black-headed Bulbul (*Microtarsus melanocephalus*). The type locality given as 'Sandwich in mares australis' appears to need an explanatory note.

VOL. II

p. 23. It may be noted that the type of the genus *Saxicola* was designated by Selby in 1825 according to statement (p. 23) but on p. 38 it is accredited to Swainson 1827. The latter seems correct.

p. 24. (*Saxicola caprata*). It seems a pity and confusing to twist round the English names of the Chats. The *caprata* group were well known as Bush-chats and are well named so, conversely the *torquata* group are well known as Stonechats (though Oates called them all Bush-chats) and the English race is actually referred to on p. 27 as the English Stone-chat. Moreover on p. 25 *S. caprata burmanica* is referred to as the Pied Chat while we have another Pied Chat (*Œ. picata*) on p. 42 and yet another (*Œ. leucomela*) on p. 45 !

p. 41. Hume's Chat (*Œnanthe alboniger*). I cannot make out the tail measurements given as 55–71. My Sind birds measure ♂ 71–75, ♀ 66–69 from base of tail.

p. 43. Pied Chat (*Œnanthe picata.*) Lest there be any doubt about my statement quoted on p. 43 that this bird is the breeding bird of Eastern Persia, I may say I have examined over 30 specimens, breeding or juveniles, from East Persia, from Serakhs in N. Khorasan to Kohi Taftan in the south. Moreover Blanford also found it breeding in the Kerman and Niriz districts.

p. 47. Barnes' Chat (*Œnanthe melanoleuca melanoleuca*). One despairs of the fixity of the Latin name of this bird. *Melanoleuca* had been long used for the eastern form of the Black-eared Wheatear till changed by Hartert to apply to Barnes' bird (Vog. Pal. F., p. 690). It was changed back again in the B. O. U. list Addenda (Ibis. 1921, p. 314) to apply to the Black-eared Wheatear but now Mr. Baker changes it back again to Barnes' chat. So the nomenclatural pendulum swings! and 'fixity' seems no nearer.

The wing measurements given (85–92) for this bird are too small, as regards Beluchi specimens at all events, as 8 males I have measured vary from 92–96.

p. 53. Tibetan Desert Chat. (*Œnanthe deserti oreophila*). Is it certain that this bird *winters* in Sikkim (whence Stevens does not list it) or anywhere else within Indian territory proper? From my investigations it appears to be a summer visitor to its breeding haunts with a well defined but comparatively narrow winter range which extends from S. Afghanistan, Seistan, Eastern Persia and the Mekran to S. Arabia and Sokotra. It appears to miss the plains of N. W. India altogether.

p. 54. Red-tailed Chat (*Œnanthe xanthoprymna chrysopygia.*) So far as I am aware this chat does not breed in British Beluchistan. I can find no record of it.

p. 79. Guldenstadt's Redstart (*Phœnicurus erythrogaster grandis*). The distribution given of this bird does not seem quite clear. The term 'N. E. Frontier' is vague and is used in various places with varied meanings. Here perhaps it means the N.E. Frontier of Kashmir? ; on p. 124 it apparently means the N.W. Frontier Province. This bird must be a mere straggler to the *plains* of the Punjab.

p. 84. Western Red-spotted Bluethroat (*Cyanosylvia suecica suecica*). This race may of course occur in the plains of N.W. India, but I think it cannot be common ; of a large series in Whistler's and my collection from Punjab and Sind not one is referrable to this race.

p. 85. Eastern Redspotted Bluethroat. (*C. s. pallidogularis*). Is it quite certain that this Bluethroat breeds in Ladak ? I examined Ludlow's specimens and considered that they were *abbotti*.

pp. 87–88. Turkistan Nightingale (*Luscinia megarhyncha golzii*). On p. 87 this bird is referred to as the *Persian* Nightingale though named correctly in the heading. The measurement for the tail of the European bird 'about 65' is too small. It runs up to 72 mm. The length of the first primary varies much in European birds and is of itself no guide ; sometimes it is equal to, sometimes it is longer than, the primary coverts. *L. m. africana* is referred to as a larger bird than *golzii* where as it is smaller.

p. 105. Blue-headed Robin (*Adelura cæruleocephala*). I can find no record for this bird in Beluchistan.

p. 113. Indian Magpie Robin (*Copsychus saularis saularis*). 'The whole of India' is far too sweeping for the distribution of this bird. There are enormous areas in N.W. India where it is quite unknown or very local and rare.

p. 123. Blackbird (*Turdus merula*). It may be a matter of opinion but it seems to me hardly necessary to consider all these six birds as races of the European Blackbird, and the explanation of their origin is somewhat fanciful. Though *maximus* and *albocinctus* approach on the limits of their distribution, there is no intergradation between the two, which suggests to my mind that they are two distinct species. Again *simillimus* and *bourdilloni* both breed in Palni Hills and so can hardly both be races of *merula*.

p. 143. Salvadori's Thrush (*Turdus obscurus subobscurus*). The wing measurement should surely be 133 not 153 (=5·25 inches).

p. 153. (*Arceuthornis*). The splitting of genera is a question no two people agree on and so, long as this is so uniformity in nomenclature is unattainable. Whether one splits off these three Thrushes from the genus *Turdus* may be purely a matter of opinion ; at the same time I think the Fauna is the only modern work in the English language which would put, say, the Black-throated Thrush and the Fieldfare into separate genera, and I fancy few will be disposed to follow this lead. The division between the two genera—sexes alike and sexes not alike—seems too artificial and in some cases a question of degree. Thus on colour the sexes of the Fieldfare are *almost* precisely alike but in most cases the sexes *can* be differentiated ; on the other hand some males of the

Black-throated Thrush cannot on colour be differentiated from the females ; moreover, in winter habits this bird is very 'Fieldfare-like.' I should be rather puzzled to know which genus to place the Ring Ouzel in !

p. 156. Fieldfare. *Acreuthornis pilaris.* The distribution given includes this bird as breeding in the Faroes. If it has ever bred there it must be very exceptional. Müller did not record it as a breeding species, nor Knud Andersen in many years reports on the avifauna of Faröe.

p. 173. Blue Rock-Thrush (*Monticola solitaria*). As I have already pointed out the oldest name for the Transcaspian bird is Blyth's *longirostris.* Mr. Baker makes this race and *pandoo* almost the same size in wing measurement From a large series of males of both races, I make the measurements to be *longirostris,* ♂ 121–127, *pandoo,* ♂ 117–123. (Ibis. 1922, p. 641). It is of interest to note that Mr. Baker considers the Transcaspian bird to breed on the Beluchi frontier and Kurram Hills whereas Col. Meinertzhagen has identified Beluchi breeding birds as *pandoo.* One would have expected the same race in both areas.

p. 177. Rock-Thrush (*Monticola saxatilis*). Does this bird *winter* in N. W. India, if so it must be excessively rare ? There were no records in the 'First Edition'. Mr. Whistler, never found it wintering in the Punjab and in Sind it is a double passage migrant, as it is in Mekran, almost certainly *en route* to and from Arabia and Africa. Whitehead too only met with it on passage in N. W. F. P.

p. 187. (*Prunellinæ*). Because the generic name *Accentor* cannot be used there is no reason why the English name should be thrown aside ; e.g. we still use the English name 'Ibis' though the Latin generic name *Ibis* has been discarded for *Threskiornis.* Moreover the two groups have for long and widely been known as Alpine Accentors and Hedge Accentors. To call the Alpine birds *Hedge-Sparrows* certainly is *not* technically correct.

p. 197. *Prunella strophiata jerdoni.* This bird may of course breed in Beluchistan though I know of no record. It breeds as near as S. Waziristan.

pp. 201–3. Eastern Spotted Flycatcher (*Muscicapa striata neumanni*). The statements that this bird is 'to some extent migratory' and is a very rare straggler to India in winter hardly describes its Indian status. It is *inter alia* a summer visitor to N. E. Beluchistan and occurs not uncommonly on autumn passage in the plains of N. W. India. I know of no record of it wintering ; it appears like several other species to winter out of India altogether. The Persian birds which I have examined certainly belong to this form.

pp. 203–6. *Hemichelidon.* Mr. Baker is certainly wrong in discarding Hodgson's names for the Sooty Flycatchers. Hodgson instituted the genus *Hemichelidon* for their reception and described the birds as *Hemichelidon fuliginosa* and *Hemichelidon ferruginea.* If the genus *Hemichelidon* is kept separate from the genus *Muscicapa,* which Mr. Baker does, then Hodgson's names must be used and are not invalidated by *Muscicapa fuliginosa* and *Muscicapa ferruginea* of prior date. If on the other hand *Hemichelidon* is merged into the genus *Muscicapa,* as Dr. Hartert does, these names of Hodgson cannot be used as the combination is preoccupied. This is yet another example, which occurs at least two other times among the Indian Flycatchers alone (viz. *Siphia hyperythra* and *Cyornis melanoleucus*), of the impossibility of uniformity in nomenclature so long as authors are divided on the limitations of genera.

pp. 255–6. Grey-headed Flycatcher. *Culicicapa ceylonensis.* The young in nestling plumage is a slightly duller and paler replica of the adult. No barring and no spotting ! So it apparently is not a Flycatcher ! The birds from N. India are easily separable from Ceylon birds by their paler yellow underparts, paler grey head and throat and paler mantle. It is not quite correct to say that this bird does not occur in the Punjab ; it is common of course in the Himalayan Punjab but it also straggles down into the plains in winter and is recorded from Jhang, Amballa, Lahore and Gujranwala.

I am very doubtful if the name *C. c. meridionalis* can stand for the Malay Peninsula bird. There is no doubt that it is distinct (as pointed out) from the Ceylon bird but three races have already been described from islets off Sumatra, viz. *percnocera* (Pulo Si Maloc Is.), *amphiala* (N. Pageh Is.) *pellonota*

(Samasura Nias Is). It seems questionable from the descriptions whether they are different to the Malay and Sumatra bird and if not one of these names will have priority over *meridionalis*.

p. 264. Indian Paradise Flycatcher. *Terpsiphone paradisi paradisi.* The original reference of this bird should be *Corvus paradisi* (Linn. S. N. ed. x, p. 107) (1758). Linneus' first reference is to Ray. (Av. 195. t 2. f 13) where the bird is described and figured from Fort Saint George, Madras, so that there was no need for Mr. Baker to have restricted it (p. 266) to Madras.

p. 271. North Indian Black-naped Flycatcher *Hypothymis azurea styani.* The distribution given for this bird 'All India north of *sykesi*' is far too sweeping. Although I obtained an unaccountable waif in Sind it does not occur so far as is known in the greater part of N. W. India at all.

p. 277. No. 700 is called the White-browed Fantail *warbler* instead of Flycatcher. The same muddle is made on p. 281, last para.

p. 283. *Laniidæ.* It is not quite correct to say the shrikes have an autumn moult only, i.e., do not moult in spring. *Lanius minor*, *L. nubicus*, *L. isabellinus* all certainly have a spring body moult and probably *L. vittatus.*

p. 285. Grey shrikes (*Lanius excubitor*). I can see no constant difference in the amount of white on the inner webs of the secondaries and so the key for *aucheri* and *pallidirostris* will fail. The tail length for adults of *lahtora* given as 100–115 is too small. On a good series I measure it as 117–129.

pallidirostris is said to have occurred only once in India; besides this Punjab specimen, I consider it to have been found at least once in Sind; but if Beluchistan is included in India as it seems to be (as the sole occurrence of the woodchat rests on a Quetta specimen) then it should be included as the breeding race in and a not uncommon summer visitor to the hills of N.E. Beluchistan. The nest was described in the Ibis., 1920, p. 150.

pp. 294–7. Rufous-backed Shrikes (*Lanius schach*).

p. 294. The characters relied on for retaining *L. tephronotus* as a species are not constant. That *erythronotus* never lacks the white speculum and has the central tail black and that *tephronotus* always lacks the white speculum and has the central tail brown, no doubt, is true for the majority of the specimens. I have seen *erythronotus* with the white speculum absent (specimens Jhang, Jhelum, Pindi, Quetta, Srinagar) and birds which otherwise are typical *tephronotus* with a white speculum or a trace of it; in some states of plumage *erythronotus* has the central tail brown not infrequently, while in *tephronotus* I have seen the central tail nearly black or the terminal half black. Then again at lower elevations in the N.W. Himalayas one finds typical *erythronotus* but in Lahul 10,000 feet typical *tephronotus* (Whistler) but in the intermediate elevations birds are intermediate between the two and a series can be formed intergrading from one extreme to the other. It is not a question of two species interbreeding as typical birds of the two forms do not occur together. I certainly should consider *tephronotus* to be the high elevation race of *schach.* 'Races of *schach* from Europe'; I have never heard of this bird in Europe.

p. 295. The tail measurements of *erythronotus* are too small; a large series measured as 108–120.

p. 297. The nestling of *tephronotus* is easily distinguishable from that of *erythronotus*; the upper parts are many shades darker grey.

Tephronotus would appear to be very rare in winter in the Punjab plains. The type localities given for these two birds are not correct. Vigors described both birds from the 'Himalayas', good reason for showing that these birds came from the area Simla-Almora has been given in the Ibis (1924, pp. 468–473). Moreover Lucknow certainly is not in the Himalayas nor should I consider Gyantse to be either. !

p. 300. Woodchat Shrike (*Lanuis senator niloticus*).

The statement that this bird inhabits the more barren and stony hill sides in Mesopotamia and is not found except as a winter visitor in the open plains is hardly correct; nor have I found any evidence of it breeding in Mesopotamia.

So far as we know it does not winter in Mesopotamia at all but is a through migrant when it usually inhabits much the same sort of country as woodchats do elsewhere (J. B. N. H. S., 1921, p. 235).

p. 301. Brown Shrike (*Lanius cristatus cristatus*). A good distinction between this bird and *isabellinus* and *phœnicuroides* lies in the comparative shortness of the outer tail feather. From the tip of this feather to the tip of the central tail feathers in *cristatus* measures 19–24 mm.; in the other two birds 10–16 mm.

p. 302. Pale Brown Shrike (*Lanius cristatus isabellinus.*) The type locality given as ' Kampada ' is hardly recognizable ; Gonfoda or Kunfuda seem to be the more usual variants in spelling. A tail measuring 64 mm. surely cannot be fully grown ? in 12 specimens measured the length is 80–86 mm.

p. 303. Rufous Shrike (*Lanuis cristatus phœnicuroides*).
This bird probably *is* commoner in India than is recognized at present, but I question whether it will be found to be so in *winter*. In Sind, Punjab, Mekran, as in Iraq, it is a decided passage migrant and it winters as far south as Abyssinia and the Sudan.

p. 329. Small Minivet (*Pericrocotus peregrinus peregrinus*).
I have already (Ibis., 1922, pp. 613–614) gone so fully into the question of placing the type locality at Amballa that for the benefit of those who have not seen this work I will only repeat that when Linnaeus described this bird in 1766 it was very unlikely that he described a Punjab bird at all; and Amballa birds are intermediate between *peregrinus* and *pallidus* ; therefore Amballa is a very unfortunate choice.

pp. 356–7. Black Drongo. (*Dicrurus macrocercus*). I am doubtful whether the Himalayan race is sufficiently distinct. No reliance can be placed on average measurements when sex is disregarded or is unknown, as obviously one group might contain more males or more females than the other. The maximal wing length and the minimal tail length in the two supposed races are precisely the same and I cannot find on my own measurements any difference in bill length between the two.

pp. 385–7. Grey-backed Warbler (*Agrobates galactodes familiaris*).
In the generic description, p. 385, it is said that the only representative of the genus in India is a ' somewhat rare winter visitor ' but on p. 387 it is said to ' probably breed practically wherever it is found.' The two statements hardly tally. It is very curious and interesting that this bird should breed not uncommonly at Multan ; no one else has met with it breeding either in Sind or the Punjab, though Mr. Baker suggests that it may be resident. Doig, Butler, Murray and myself all failed to meet with it in the breeding season in Sind nor has Mr. Whistler discovered its nest in the Punjab. Outside Major Lindsay Smith's records it is only known in the plains as a passage migrant and in two years I only came across it, and then not uncommonly, between September 3 and 24. Mr. Baker does not quite do me justice when he says I have not stated from where to where these migrants were going. I stated my opinion twice ! (Ibis., 1920, pp. 531 and 547.) The description of this bird's breeding haunts given as ' in *low stunted* bushes that do not average *20 feet high* ' makes one wonder what the *really fine* bushes at Multan are like ! I saw none there to merit this somewhat ' Americanized ' comparison !

pp. 389–90. Indian Great Reed Warbler (*Acrocephalus stentoreus*).
As Mr. Baker says—more breeding specimens are required to elucidate the two forms. I think it is very doubtful if the Sind breeding birds will be found to be *amyæ* ; a large series which I collected in Sind are without doubt *brunnescens* though none are breeding birds ; yet if *amyæ* is resident there one might expect that one or two out of a winter series to belong to this race. Gonda in the U. P. is included in the breeding range of *amyæ* but a March bird thence in Mr. Whistler's collection is as pale as Kashmir breeding birds and no smaller than some ; a worn breeding bird is too worn to say much about.

p. 393. Blyth's Reed Warbler (*Acrocephalus dumetorum*).
It is stated that the second primary is equal to the eighth or is a little shorter. In a large series I find the second primary is just shorter than the 5th or than the 6th. The type locality (omitted) should be ' India.'

p. 401. Streaked Grasshopper-Warbler (*Locustella lanceolata*).

The type locality is given as 'Mainz, Irtum.' The latter word does not appear to be a locality at all but a German word (mis-spelt!) meaning an error! The correct type locality should be 'Russia.'

p. 402. Eastern Grasshopper-Warbler (*Locustella nœvia straminea*).

This bird may occur more commonly in N. W. India than records indicate but to say that it occurs 'in great numbers' gives rather an erroneous impression. In three winters I saw a few at one spot only, a certain reed-bed on the Munchar Lake and nowhere else in Sind while in the Punjab Mr. Whistler has only met with it at one place.

p. 411. Indian Tailor-Bird (*Orthotomus sutorius sutorius*).

Tail length, 28–112 mm. (summer) is surely a mistake? I have not seen a tail in the breeding season as short as this.

p. 417. (*Lusciniola*). Though some ornithologists unite *Tribura* with *Lusciniola* I do not think anyone nowadays puts *L. melanopogon* into any other genus than *Lusciniola*; indeed it is the type of the genus.

p. 427. Assam Wren-Warbler. The original reference gives the sub-specific name as *assamensis* instead of *austeni*.

pp. 442–5. The Tree-Warblers (*Hippolais*).

The tail length of *H. rama*, given as 47–52, is too small and is much the same as that given for *H. scita*, consequently the comparative shortness of the tail in the latter species is not emphasized though I have found it to be a useful character. I measure *rama*, T. 52–57, *scita* T. 45–52.

As I have already pointed out the evidence for the inclusion of *Hippolais pallida elæica* in India is very flimsy and rests on Dresser's statement that he had seen a bird from Sind. Some error is possible since no one else has ever obtained it in India. The two birds referred to as being in Col. Meinertzhagen's collection are *not* in his collection but in the Quetta Museum and neither of them is *p. elæica*.

Hippolais obsoleta is a bird of mystery but *if* it has a tarsus of 30 mm. it must be a good species!; but an alleged specimen from Sind identified by Seebohm is rather scanty evidence for admission to the Indian list. If this species *is* a good one the distribution given—Fao, Turkestan and Sind—is a very extraordinary one for a bird described from *Moscow*!

p. 447. Indian Whitethroat (*Sylvia communis icterops*).

Does this bird *winter* in India as stated? Oates only knew of September specimens and Mr. Whistler and myself have only met with it in September and October on passage.

p. 449. Desert Warbler (*Sylvia nana nana*).

The reference given as '*Sylvia affinis* Blanf. and Oates; p. 396' is of course a slip. A 'third hand' clutch of eggs without the bird and without precise data seems somewhat slender evidence for inclusion as a breeder within Indian limits.

p. 457. Indian Lesser Whitethroat (*Sylvia curruca affinis*). I am very doubtful whether this bird breeds at Quetta, Gen. Betham informed me that he may have been mistaken, though he thought he sent breeding birds to Bombay Museum. Enquiries there however have not brought any to light.

p. 452. Small Whitethroat (*Sylvia curruca minula*). This too is stated to breed in Beluchistan; I know of no good record of it. *If* both these Whitethroats do breed in Beluchistan they cannot both be races very well of *curruca*.

p. 453. Genus *Phylloscopus*. These birds are of course *winter* visitors to the plains, not summer as stated.

The key in the first edition of the *Fauna* failed because it tried to separate birds into one group which have dark heads and coronal bands from those which have not, and into the first group was put *Phylloscopus humii*. The same fault has been repeated in this edition. The majority of specimens of *humii* have the coronal band and the dark part of the crown so ill defined that they are easily put into the wrong division of the key. The key in the second edition I think would work better if for the group with 'no coronal bands' were substituted 'no wing bars' and for those 'with coronal bands', 'wing bars or a trace of bars present.' But even with this modification a beginner would get mixed up with *sindianus* and *neglectus*.

p. 456. Tytler's Willow Warbler (*Phylloscopus tytleri*). The winter distribution as regards Western India needs modification; this bird is not found in Sind nor can I find any record of it in the Punjab plain. Like some other species it perhaps reaches the Himalayas via the Siwaliks as suggested by Mr. Whistler in other species.

pp. 456-8. (*Phylloscopus collybita*). Mr. Whistler has never been in Ladak and therefore he could not have obtained *Phylloscopus sindianus* breeding there! Specimens which he obtained breeding in Lahul I certainly think are *tristis* as they still retain a trace of the greenish tinge on the wings. When all green tinge has worn off the plumage of breeding birds it is practically impossible to differentiate the two races. In the field the alarm note might be a good guide as Brooks pointed out a very distinct difference.

In winter *sindianus*, so far from 'keeping to semi-desert and poorly wooded tracts,' in Sind is found in the best wooded parts of the province—thick babool jungle in the Indus and canal areas. In anything approaching desert I never saw it as I have already pointed out in the 'Birds of Sind.'

p. 460. Olivaceous Willow-Warbler (*Phylloscopus griseolus*).

By a slip this is called the Olivaceous *Tree* Warbler. Far from being 'doubtless a common winter visitor to the Punjab' I think it will be found that like *Phylloscopus tytleri* it does not normally winter in these plains at all; at any rate that is in accordance with such evidence as we have as, though Mr. Whistler has found it on migration in the Punjab plain, he has never found it wintering there.

p. 469. Hume's Willow-Warbler (*Phylloscopus humii humii*).

This Willow Warbler does not breed or even occur in Beluchistan so far as is known.

p. 470. Crowned Willow-Warbler (*Phylloscopus humii præmium*).

In view of the other Crowned Willow-Warblers it seems a pity not to have altered this name to the name accepted in England, viz., the Yellow-browed Willow-Warbler.

In the foot-note Mr. Baker says that *Phylloscopus inornatus* of Blyth cannot be used for this bird as Blyth stated subsequently that it does not apply to this species. I do not know where he stated this but how does it alter the facts. ? Blyth in his 'Catalogue' places *inornatus* as a synonym of *modestus* (= *proregulus*) which, from the description of *inornatus*, could not be correct. He evidently realized this as in a copy of his Catalogue, Blyth altered this in his own handwriting, putting *inornatus* as a synonym of *superciliosus*. Because an author thinks he has made a mistake and says that a bird described by him, he thinks, is in reality another species, the name is not invalidated if the description holds good. For instance Blyth thought erroneously that his *Turdus dissimilis* was only the male of *Turdus unicolor* but that does not invalidate Blyth's name (cf. F. B. I, ed. ii, vol. ii, p. 141). So too Hume renounced his *Pellorneum minus* and said it was only *P. ochraceum*, this was afterwards proved to be wrong and *P. minus* stands.

Mr. Baker cannot separate *Phylloscopus mandellii* from this bird; if that *is* so then *præmium* is the same bird as *mandellii*, and the latter name has thirty-six years priority over *præmium*! To add to the muddle on p. 47 he calls the bird *P. h. superciliosus*.

p. 490. Kashmir Grey-headed Warbler (*Seicercus xanthoschistus albosuperciliaris*). Mr. Baker may possibly have some source of information not available to me concerning Beluchistan, but like several other species mentioned in the Fauna, I can find no record of this species within the Agency. Most of Beluchistan is quite unsuited to it.

p. 507. White-bellied Bush-Warbler (*Horornis albiventris*). The type locality is given by a slip as Kashmir; it should of course be Hengmai, Manipur Valley, as stated under 'Distribution'

p. 520. Sind Hill-Warbler (*Suya crinigera striatula*). This bird certainly does *not* inhabit the plains. It may wander down in winter to almost plains-level, but it does not leave the hills.

p. 526. Indian Streaked Wren-Warbler (*Prinia gracilis lepida*). The distribution of this bird extends at least to the United Provinces whence I have a breeding bird from Futtehgurh.

p. 533. Aboo Jungle Wren-Warbler (*Prinia sylvatica rufescens*). The name *Prinia rufescens* cannot be used for this bird as it is preoccupied by Blyth's *Prinia rufescens* (= *Franklinia rufescens*) see p. 427. Hume described this Wren-Wrabler from Mt. Aboo, Garhwal, Satara District and Etawah (Ibis., 1870, p. 111) and he described it again as *Drymoipus insignis* (S.F., i, p. 10) from Mt. Aboo and Central Provinces. Hume was certainly confused (and little wonder !), by the seasonal and age plumages of this Warbler and described twice over the Mt. Aboo bird and mixing up with both, *Prinia sylvatica sylvatica*. It is perhaps questionable whether Hume's names can stand, but as he indicates a greyer tone of plumage in *insignis* and cites Mt. Aboo as a locality, I think perhaps the name *Prinia sylvatica insignis* may stand for this bird which I think is by no means restricted to Mt. Aboo, but to which place I now restrict the type locality.

p. 539. Himalayan Goldcrest (*Regulus regulus himalayensis*). There is no need to restrict the type locality to Srinagar as Mr. Baker has done, as the correct type locality, even if not well known, can easily be found out. Jerdon described this bird from Blyth's MS. In the Ibis, 1870, p. 168, Blyth says he had only seen one specimen which he believes was procured near Simla. In the *Zoologist*, 1886, p. 443 there is the account of obtaining this specimen by Surg.-Gen. Stewart near Kotegurh and this must be the type locality.

LOWESTOFT, *July 1925*.

REVIEWS

'INDIAN BIRD LIFE' BY DOUGLAS DEWAR. (John Lane, 7*s*. 6*d*. net.)

We have again to chronicle the appearance of a new book on Indian Birds by that prolific writer Mr. Douglas Dewar, and have no hesitation in pronouncing this youngest of his literary offsprings as one of the most interesting and valuable.

Its theme is succinctly described by the sub-title 'The Struggle for Existence of Birds in India'. Mr. Dewar has set himself to analyse the various causes that work to prevent the indefinite increase of birds by the rapid mathematical progression of reproduction. He takes us chapter by chapter through the natural causes that work to destroy birds, their eggs and their offspring; and as he goes he cites chapter and verse for his assertions, drawing his examples from his own observations and from the published observations of the various field naturalists that have worked in India.

The purpose of the book is to fill a supposed gap in the writings of Darwin. Darwin enunciated the fact that a struggle for existence must invariably be the corollary of the high rate at which all organisms tend to increase; at the same time he admitted our general ignorance of the nature of the struggle and the exact checks that operate in any particular instance.

Mr. Dewar has set himself to collect some of the evidence that bears on these points in India; and India should surely be one of the best fields for this enquiry with its prolific fauna and its prodigal waste of life.

The chapters before us show how a bird is at the mercy of destructive forces in every stage of life. The adult bird itself suffers from predatory birds and animals, from the greed or the sport of man, from disease and accident and from the forces of Nature acting on the bird direct or through its food-supply. The accidents that befall nest and eggs and young are each in their turn discussed at length.

This tragic recital occupies the main body of the book and is followed by a chapter which endeavours to appreciate the factors contributing to the success or failure in the struggle for existence of certain species like the *Mynah* or the Pink-headed duck.

In the final chapter Mr. Dewar arrives triumphantly at his conclusion that the checks on the multiplication of a species are purely fortuitous in their application to individuals; and that being fortuitous they must therefore have little or no effect on the colour or anatomy or physical characteristics of the species on which they operate, though he admits to a certain effect on features connected with breeding, migration or character.

The book then is in the nature of an attack on the theory of Natural Selection. It is however a reasoned and legitimate attack far removed from the irritating side attacks and pin-pricks on the Darwinian theories that disfigure most of Mr. Dewar's writings. Opinions may differ as to the value of the evidence cited by Mr. Dewar and it is evident that the book has been written hastily without sufficient study or material. The conclusions reached are not necessarily correct. But there can be no doubt that Mr. Dewar has written an interesting book which he might well use as the ground work for a more careful and more important study.

H.W.

'MANUAL OF THE BIRDS OF CEYLON' BY W. E. WAIT, M.A., F. Z. S., M.B.O.U., Ceylon Civil Service. (Ceylon Journal of Science, Rs. 10.)

Those of our members who are resident in Ceylon or interested in the Ornithology of that country will have every reason to welcome this Manual of the Birds of Ceylon which Mr. Wait, our member, has prepared on the suggestion of the Director of the Colombo Museum. For some time past there has been need of an up-to-date text book to convey in handy form the advances in method and knowledge since Legge's magnificent but expensive work was published. That work has long since been out of print and is now difficult to procure, and it was written before Mr. Stuart Baker and other writers introduced the trinomial system to workers in the East; and though information regarding the birds of Ceylon is available in the excellent volumes of the Fauna of India series it is a cumbersome and unsatisfactory arrangement that workers in Ceylon should have to satisfy their needs by delving in a work which applies to so large and diverse an area as that treated of in the Fauna.

Now in Mr. Wait's book they have an excellent and compact hand-book to the birds of Ceylon, with the further merit that its price is such as to bring it within the reach of every student. The usual stumbling block experienced in a work of this nature that the cost of reproduction prohibits a liberal series of illustrations has been partly avoided by securing the services of the staffs of the Museum and the Survey Department to produce a series of plates which illustrate some of the most typical representatives of the various orders and families found in Ceylon. Although the drawings are stiff and conventional they undoubtedly serve their purpose, and it would therefore be unfair to overstress the fact that they share the decline in the standard of illustration which has been rather a marked feature in post-war ornithological publications. An excellent Survey Department map has been included.

For the text of the book we have nothing but admiration. Mr. Wait's introductions to the book, to birds and their classification, and to the various orders and families, are each admirable in their way imparting scientific facts in language which combines scientific accuracy with plain intelligibility to the unscientific student; while his descriptions of each individual species are well framed to supply exactly the information required by the beginner and by the ordinary student. The advanced specialist will not find here or elsewhere in the book all that he requires, but for this minority the book has not been written.

The account of each species commences with the correct names scientific and English, and the local vernacular names when such exist. Those are followed by the first reference to the name now used and by the references to the species in Legge's *Birds of Ceylon* and in the first edition of the *Fauna of British India,* so that where changes of nomenclature have occurred old friends may be recognized under their new names.

Next the bird is described in simple but clear terms, the differences between the sexes being clearly indicated and some idea being also given where necessary of the immature plumage and any marked seasonal changes. The colour of the soft parts and the average measurements in inches are also given.

The paragraph on distribution then describes very briefly the general distribution of the species and so far as is known its status and distribution in Ceylon and where relevant its connection with Southern Indian forms; and we are glad to see that more care has been taken than is usual in a work of this nature to indicate the times of arrival and departure of the migratory species. It is an interesting fact that all migratory birds in Ceylon are winter visitors, as the island lies at the terminus of the routes which run through India from the north, so that there are no passage migrants to the island and no summer visitors; a fact that must greatly simplify all ornithological observation in the island. Apparently also owing to the absence of any well marked procession of the seasons the hill birds do not indulge in any altitudinal movement, but this point Mr. Wait does not seem to have made clear. The Ornithologist in Ceylon has to confine his speculations chiefly to the effects on distribution of the rain belts.

The account of each species then finishes with a short paragraph on the habits and nidification written in clear and homely language. There are the usual keys and a helpful chart of the external parts of a bird and short glossary; and the various lists and indices are fuller and more satisfactory than in the usual run of popular books.

Altogether a satisfactory piece of work on which we heartily congratulate Mr. Wait.

H. W.

'A HANDBOOK OF THE BIRDS OF EASTERN CHINA' BY J. D. D. LA TOUCHE, C.M.Z.S., ETC. (Taylor and Francis.) Part II. December 1925. (7*s.* 6*d.* net.)

Students of the Avifauna of the Far East will welcome the appearance of the second part of Mr. J. D. D. La Touche's work on the birds of Eastern

China, the first part of which was reviewed at p. 211, vol. xxxi of the Journal. This new part deals with the families of the *Cinclidæ, Turdidæ, Muscicapidæ* and *Laniidæ* and is illustrated with four plates, which have been well reproduced from photographs. There is an interesting photo of captive Ruby-throats tethered on perches along a wall, and a picture of the nest of a Paradise Flycatcher *in situ.* The remaining photographs show typical views of Chinese scenery.

The text of course follows the same lines briefly indicated in our review of the first part, though the accounts of some species are slightly fuller and more interesting than in that part. Many of the species and races dealt with are familiar to ornithologists in India. If Mr. La Touche is right in his identifications, some of our Himalayan species such as *Monticola erythrogastra* and *Chaimarrhornis leucocephala* are found from the Western Himalayas to China without even subspecific variation; though this seems curious in view of the fact that most Himalayan species have developed eastern and western races with their junction about Nepal.

We must however take serious objection to the inclusion of the Indian Grey Shrike, *Lanius ex. lahtora* in Mr. La Touche's list. It is included there as a fairly regular passage migrant and winter visitor purely on the authority of Pére David. His record is supported by the statement 'This bird winters in India and, according to David and Oustalet, proceeds in summer to Central Asia'. Mr. La Touche is apparently troubled by this record for he cites Hartert, Dresser and the *Fauna of British India* in their perfectly correct rendering of the distribution of this race of the Grey Shrike. Now it is well known that our Indian bird is absolutely sedentary, and the difficulty in identification of the races of Grey Shrike is equally well known. This record, apparently unsupported by skins, should therefore have been refused by Mr. La Touche whose authority is sufficiently well known to entitle him to suppress older and obviously erroneous records. There are other signs in the work that the author should be more drastic in his treatment of previously recorded observations. It is the part of an experienced authority to sift the materials that have come down to him.

This second instalment of the book however supports our previous opinion that Mr. La Touche is conferring a great benefit on all students of Chinese Ornithology.

H. W.

'THE AQUARIUM BOOK', BY E. G. BOULENGER. (Duckworth, 3 Henrietta Street, London, W.C.).

This book by the Director of the New Aquarium at the London Zoological Gardens should appeal to the scientist and sportsman as well as to the amateur aquarist and man-in-the-street for whom it was primarily written.

In an introductory chapter, for the most part historical and descriptive, the author gives an interesting account of the elaborate mechanism behind the show tanks at the Zoo's Aquarium, the perfect design of which is the result of much patient investigation into the various methods adopted at the other large Aquaria of the world.

The book itself is divided into two parts, one dealing with Salt water, the other with Fresh water organisms. The author does not confine himself to fishes but includes chapters on salt and fresh water Invertebrates, and Aquatic Reptiles, Batrachians and Mammals. Of the vast number of backbone-less creatures which are common to all the waters of the earth, only a comparatively small proportion can be kept alive in an Aquarium. These, however, include many well-known species, and Mr. Boulenger recounts some very interesting observations which he has been able to make on some of the more lowly forms in his tanks.

His remarks upon the fighting habits of the Common Lobster and the description of the moult which takes place from time to time in these and other Crustaceans, show that he has taken full advantage of the unequalled opportunity for the study of the habits and bionomics of his charges. Another astonishing fact about the lobster which he tells us is that 'by stroking it in a certain direction a coma is produced, so that it remains perfectly still, when it can be made to rest tail upwards, standing on its beak and outstretched claws!'

There are many little occurrences of interest which take place in the daily round of the Aquarium; there now flourishes in the filter beds an ever-increasing colony of shrimps and prawns which have escaped down the overflow pipes of the show tanks and are being used as food for some of the other inhabitants of the Aquarium.

It is interesting to learn that the Common Cockle can leap in the water and in fact does so with great energy when its deadliest foe, the Starfish, is introduced into the tank. The leap is produced by a sudden opening and shutting of the valves of the shell.

Practically all fish become tame after a very short time in captivity. This is mainly attributable to regular feeding. There is one six-foot-long Conger at Regent's Park which can be lifted bodily out of the water after he has been fed and many of the smaller fish will come to the surface and nestle in the hand.

The chapter which deals with the Lung fishes and their transport to England in bricks of mud during the period of torpidity is intensely interesting. At present the Zoo is fortunate in having examples of *Ceratodus* from Australia, *Protopterus* from Africa and *Lepidosiren* from South America, all of which have been sent home in the dry state.

Mr. Boulenger has so many other fish stories to tell—all true—and all so equally enthralling that it is impossible to enumerate them here.

Suffice it to say that his book teems with interesting facts from cover to cover. It will appeal especially to those who have already made the pilgrimage to that 'Aladdin's Cave of Treasures' which lies beneath the Mappin Terraces at the London Zoo and will be a source of much enjoyment and instruction to those who have not yet had the opportunity to do so.

The illustrations alone make the volume worthy of a place on the bookshelf. Some are photographs taken in the Aquarium, by no means an easy feat, and there are many beautiful line and wash drawings done from nature by Mr. L. R. Brightwell.

'ACCOUNT OF A PHOTOGRAPHIC EXPEDITION TO THE SOUTHERN GLACIERS OF KANCHENJUNGA IN THE SIKKIM HIMALAYA', BY N. A. TOMBAZI, F.R.G.S. (Maxwell Press, Bombay).

The author has given a delightful account of a tour in an out of the way part of Sikkim in which he succeeded in reaching the pass between the Talung and Zemu valleys which Mr. Douglas Freshfield called the Zemu Gap. This was a notable achievement and has, we believe, never been accomplished before. The author is clearly an enthusiast in mountain scenery and travel, and among his descriptions he has interspread many useful hints on travel which will be of great assistance to those who follow him. Mountaineering in the Eastern Himalayas must always be difficult on account of the peculiar local conditions; except in winter, when extreme cold makes travel at great heights almost impossible, the rains greatly add to the hardships and discomforts of travel, and clouds detract from the enjoyment.

The author suffered severely from bad weather but his enthusiasm enabled him to catch the short but magic period just after dawn when the snows are clear, as his photographs bear witness.

We take liberty to doubt whether the birds seen by him below Jongri were Snow-cock (*Tetraogalius tibetanus*). These birds were seen in juniper forest somewhere below 11,000 feet, whereas the Snow-cock according to the *Fauna of British India—Birds*, rarely, if ever, descends below 15,000 feet. The writer once saw a brood of chicks in dwarf rhododendron at an altitude of about 14,000 feet, but it is doubtful if they descend below this altitude. It is more probable that the birds were Blood Pheasants (*Ithagenes cruentus*); their tameness also points to this probability.

The author actually saw at a distance of 300 yards what the coolies described as a 'Kenchenjunga demon' and what was apparently the foundation for the stories of 'wild men' in these mountains. He writes, 'unquestionably, the figure in outline was exactly like a human being, walking upright and stopping occasionally to uproot or pull at some dwarf rhododendron bushes'. It wore no clothes as far as he could see. The footprints 'were very similar in shape to those of a man, but only six to seven inches long by four inches wide at the broadest part of the foot. The marks of five distinct toes and of the instep were perfectly clear; but the trace of the heel was indistinct and the little that could be seen of it appeared to narrow down to a point. I counted fifteen such footprints at regular intervals ranging from one and a half to two feet. The prints were undoubtedly of a biped, the order of the spoor having no characteristic whatever of any imaginable quadruped'. It is unfortunate that something more could not have been done to solve this mystery.

The book is beautifully got up and illustrated with a wonderful series of views, the actual contact prints being pasted in the book. In many cases the view-point from which the photos were taken is not given. This and an absence of dates in the narrative are two points which might, we think, be considered should the author contemplate a large edition or a future account of this kind. It seems a pity that a book of such merit should be limited to an edition of only 150 copies. The tables at the end of the book will prove useful but the map is rather indistinct.

F. M.B.

'LIFE OF PLANTS', BY SIR FREDERICK KEEBLE (Clarendon Science Series) xii+256 pages. Oxford, at the Clarendon Press, 1926.

'The growth of Science,' says the author in his preface, 'is like that of a tree. From seed-growing to harvest the time is long and tedious to those who look for fruits. But during that time there go on obscurely and below as well as above ground unending successions of very wonderful developments. Not until they have been accomplished are blossom and fruit produced, and then profusion and beauty are apparent for all to see. Yet to those who tend them the science and the tree are beautiful always, alike in their obscure beginnings and in their brilliant fulfilment. To show this has been my object: to suggest that science is more than a body of doctrine—an illumination of life.'

Keeble, with the modesty of a true scientist, is afraid that he has not succeeded, for he thinks that the task has proved beyond his powers. I cannot agree with him. His book is certainly a successful attempt to impart understanding of the method and to convey impressions of the beauty of Science. I do not want to imply that Keeble has spoken the final word on the subject. He must realize himself, much better than I do, that we are still far removed from the time when we shall be able to give an adequate picture of the life of plants. And even when science will have succeeded in listing all the manifestations of life, it does not follow that by doing so, we have also established the internal connections between, and causes of, those manifestations.

Linnaeus says somewhere in his *Philosophia botanica*: 'Principium erit mirari omnia, etiam tritissima. Medium est calamo committere visa et utilia. Finis erit naturam accuratius delineare quam alius.' Keeble seems to have followed these words, if not in the composition of his book, at least in preparing its substance. The volume scarcely contains anything that you could not find in many other publications. It deals with the ordinary facts of plant-physiology: the manufacture of food-materials, the absorption of radiant energy by the green leaf, the mobilization of food-materials for construction and power-production, the environment of the land plant, variation, heredity, evolution, etc. And still, this book differs in many ways from others of a similar size and aim. Every page offers a wealth of well-defined information; the reader feels that it has been written by a hand that has felt the pulse of the living plant for many years; he knows that the author could tell him much more than he does and that what he offers you is only a condensed abstract of a vast accumulation of facts. You are not drowned in a sea of ill-digested and badly arranged details. The author is always conscious of what he wants his book to be—an 'illumination of life'. There are botanists in India who write on the same subject and with the same aim, viz., to shed light on the mysteries of plant-life. But they have been induced to dispel the darkness by exaggerating the actual state of our knowledge of certain problems, and by not distinguishing critically between facts and products of imagination. Keeble is not of this type. To him a fact is a fact, a hypothesis is a hypothesis, an attempt to explain a certain process remains an attempt, and no plausible explanation, if it is not supported by solid data, will induce him to call that attempt a scientific explanation. To give only one example. There is that much-discussed problem of the ascent of sap. Some say they have solved it, and they have found the key to solution in a very simple experiment, and we cannot help wondering why none of the workers before them made use of the same magical wand. Keeble is more modest, and he is modest because he is a true scientist. The problem of the ascent of sap, he says, 'has not even now received an answer which completely satisfies every one who has investigated it.' And after three pages of tentative explanations he is not ashamed to confess that 'the study of transpiration leads from the clear domain of the certain to the dimly uncertain, and beyond to the unknown, the darkness of which only future research may enlighten.'

Keeble's *Life of Plants* is a book that every educated man will read with interest and profit. It is a sober, reliable, and honest account, stimulating at the same time and apt to widen the intellectual horizon without causing mental indigestion.

E. B.

CORRECTION

The note on a 'Panther with Abnormal Feet' which appeared on page 909 of Volume XXX of the Society's Journal was the contribution of His Highness Maharao Khengarji of Kutch, G.C.S.I., G.C.I.E., and not of Maharaj Kumar Shree Vijayarajji as published.

Editors.

EDITORIAL

Our President—His Excellency Sir Leslie Wilson—referred at some length in his speech at the Annual Meeting to the work the Society proposed to do in training teachers in Government Schools to become in their Schools efficient teachers of Nature Study or, as we prefer to call it, Natural History.

He expressed his regret that the knife of retrenchment prevented Government budgeting this year for any financial grant to the Society for the purpose, but gave vent to the hope that some public-spirited citizen of Bombay would help the Society by subscribing funds sufficient for the first year, during which the Education Department would study the work done, and, if it were considered likely to succeed, then there would be strong probabilites of Government budgeting in the future for the expense of maintaining the scheme.

There are many public-spirited men still living in Bombay but so far as the needs of the Natural History Society are concerned the vast majority seem to be suffering from an inability to find their way to the pocket in their trousers where their purse is kept. No doubt, like the small boy when first put into knickers, they have put their hands so often into their pockets that, to protect themselves from perhaps having no pockets in the future, they have had their pockets sewn up. There is one public-spirited gentleman in Bombay who has determined that so far as help in educational matters is concerned his purse pocket should never be closed. We refer to Sir Sassoon David, Bart., who has established a Trust and a Committee of Trustees to deal with that Trust, whereby the interest on a large sum of money shall be available for educational needs of proved utility.

Having a good cause we approached the Trustees and we have now the pleasant duty of expressing our thanks to the Trustees for their right appreciation of the situation and to Sir Sassoon David our gratitude for his princely generosity. We have received from the Trustees a cheque for Rs. 6,000 and have informed the Director of Public Instruction that we are prepared to depute our Assistant Curator, Mr. Salim A. Ali, to be Guide, Philosopher and Friend to all those at the Government Training College, etc., who wish to learn how to make the wonders of Nature legible and intelligible to children of all races in our schools in the Bombay Presidency.

We owe our thanks too not merely to the munificence and foresight of the living but also to the munificence and foresight of those who have passed away but whose name liveth for ever, and surely the name of N. M. Wadia, whose magnificent charity has benefited so many and been on such a Catholic scale, will never be forgotten in Bombay. The Trustees of the Wadia Charities recognizing that besides the lecturer and his salary, apparatus, etc., would be necessary, have given us Rs. 750 and we are very grateful to them. This is not the first time they have helped us. In April 1913 they gave us Rs. 500, in September 1923 Rs. 500, and in 1921 Rs. 1,000 for the Mammal Survey of India, Burma and Ceylon.

We are confident that members of the Society will cordially approve this fresh activity of the Society. We do not exist purely for our own benefit, but to spread the knowledge of the Fauna and Flora of India and so benefit others.

For ourselves, we are more than glad to see again in the Journal an article by Mr. Stuart Baker on the Game Birds of India and to welcome as frontispiece a coloured illustration by Mr. Gronvöld. These illustrations are expensive but we do not think they are luxuries. They are appreciated by members and are therefore of benefit to the Society. They are appreciated by non-members and so are an advertisement to the Society.

We say they are appreciated by members and we know they are, but we wish members would show their appreciation in a practical manner.

There are to be five volumes of the Game Bird series. Two have already been published both in the Journal and in book form. Two have been published in this Journal—'Pheasants' (vol. xxiii to vol. xxvii) and 'Partridges and Quails' (vol. xxvii to vol. xxx) and the fifth and last volume. 'The Waders and other Semi-Sporting Birds' is now being published in the Journal but the publication of this volume in book form and the issue in book form of the preceding volumes iii and iv depends entirely on the appreciation members show of the two volumes now available in book form. We published 1,500 copies of the second edition of volume i and 1,500 copies of the first edition of volume ii. 1,000 copies of No. 1 and 1,100 copies of No. 2 have been bound. We have on the lowest estimate 1,400 members. Yet in five years we have only sold a total of 512 copies of volume i and 671 copies of volume ii. Members have not supported the Society by subscribing for the volumes as they should have done, yet members can obtain the volumes at special reduced rates and no member who has bought the volumes has considered that Rs. 52 for volume i and Rs. 44 for volume ii is anything but a very cheap price. Even where a member is not interested in small Game Shooting, he must be extraordinarily unfortunate if he has not got a friend who is and who appreciates a good gift. The gift of these volumes does indeed bless both him who gives as well as him who receives. Every book purchased releases for the needs of the Society a much wanted sum of money. The reserve fund of the Society is invested in these volumes and until they are sold that reserve is of no help to us. We wish for a moment that the Society was run on the lines of a trade union and that we could use peaceful picketing against every member, every Officers' Mess and every Club in India which does not possess the volumes. Will members make a special effort and order ? Let them remember their sisters and their cousins and their aunts, their nephews or some other youngster who would enjoy life in India better if he had a good knowledge of the Game Birds of this country and Burma, and, remembering, fill up the order form which he will find loose in this Journal.

We said farewell on the 1st June to the Curator, Mr. S. H. Prater, who left Bombay on deputation to America. Mr. Prater intended to spend a few days in Central Europe visiting Museums and, after a brief stay in England, will reach New York about 15th July. He will return to Bombay at the end of December 1926 and we look forward with interest to the reforms and innovations which will result—his return will however not be an unmixed blessing to the Honorary Secretary. Will he have learnt in the land of the Almighty Dollar to make bricks without straw or will it be a duet of ' They do it like this in America and we must do the same.' ' It can't be done, Prater, there is no money.' Will there ever be an occasional chorus ' Well the Maharaja of ————————became a Vice-Patron this morning, you can mount your group of Elephants '. It's the occasional chorus we want and with His Excellency the Viceroy and His Royal Highness the Prince of Wales as Patrons surely some of India's Princes who are members of the Society might become Vice-Patrons and give us Rs. 5,000 to commemorate their name in the Prince of Wales' Museum.

Since writing the above we have received, through the kindness of H. H. the Maharaja of Rewah, the skin of a white tiger. Unfortunately it was shot at the hottest time of the year and in a distant jungle and its condition causes great anxiety to our Taxidermists. Even should they be unable to preserve the skin so as to mount the trophy in our Museum—and what a splendid trophy would it not be !—yet the possession of the skin of a white tiger in our research collections is something to be very grateful for, and we are sure all members of our Society will join in our expression of thanks to His Highness.

Major Colvin writes us in connection with the shooting of the trophy as follows. ' It was shot at the hottest time of the year in a distant jungle on the borders of Rewah and the Korea State. Two other white tigresses were seen in beats by His Highness in the same vicinity, but were spared. In all three white tigers have been shot by His Highness, two others (tigresses) have been seen recently and one (a tiger) died in captivity here in 1925 during the hot weather.'

He adds, ' If you mount the head, the eyes should be very pale, almost " wall-eyed " colour. There is no pink about them at all.'

For further particulars about white tigers in Rewah State and for a photograph of one in captivity (evidently the one which died in 1925) we would refer members to an article on the subject written by the Editors and published on page 932 of volume xxvii of this Journal.

As regards the occurrence of a Black Tiger we would refer members to Mr. T. A. Hauxwell's note on the ' Possible occurrence of a Black Tiger ' which appeared on page 788, vol. xxii, Major Stewart Capper's note ' Black Tigers ', page 343, vol. xxiii, and to General R. G. Burton's note on page 216 of this volume.

We have much pleasure in announcing that Miss Comber has presented to the Society the valuable collection of Hymenoptera made by her father, the late Edward Comber, when in India. We also congratulate Col. R. W. Burton on his recovery from the severe injuries he received from the fall from his Machan. We look forward to his return to India and shikar in November 1927.

OBITUARY

MR. S. BASIL—EDWARDES

We regret to announce the death on the 2nd December, 1925, of Mr. S. Basil Edwardes, a rising young Naturalist.

Mr. Basil-Edwardes was a member of the British Ornithologists' Union and joined this Society on the 8th February, 1918, ever since which time he has been a fairly regular contributor to our Journal.

He was a keen observer of Nature and we have a number of extremely well written notes from his pen in our Journal.

Mr. Basil-Edwardes *forte*, however, was Ornithology, for which branch of Natural History he displayed great aptitude and still greater promise.

Some of his contributions are :

On the Homing Flight of the Common House Crow (*Corvus splendens*), vol. xxviii.

The Nidification of the Himalayan Tree- Creeper (*Certhia himalayana*), vol. xxix.

'Notes on Birds uncommon in or unrecorded from the Simla Hills'. vol. xxxi.

The first part of his latest paper 'A Contribution to the Ornithology of Delhi,' appears elsewhere in this number.

We, who have recently had the pleasure of handling a collection of birds made by Mr. Basil-Edwardes, and others who were acquainted with his work, realize to the full the loss that Indian Ornithology has sustained through his untimely death.

H. H. SIR UDAJI RAO MAHARAJA OF DHAR

The Society has sustained another loss in the death on 30th July after a prolonged illness of His Highness Sir Udaji Rao Puar Sahib Bahadur, Maharaja of Dhar, K.C.S.I., K.C.V.O., K.B.E.

His Highness was an enthusiastic member of the Society which he joined in 1904. He was an ardent Sportsman and took a very intelligent interest in Natural History. He paid a great deal of attention to the problem of bird migration and lately the Society had the privilege of supplying him with a large number of identification rings such as are in use at a number of Bird observation stations in Europe and America. Should any member ever happen to shoot a ringed duck or other Game Bird bearing the inscription 'Inform Maharaja Dhar' he may at once put it down to the naturalistic zeal of this enlightened ruler.

The following articles written by H. H. Sir Udaji Rao Puar have appeared in our Journal :—

'Comments on the colour change of the Black Buck *Antelope cervicapra*', vol. xxix.

'Records with Snipe', vol. xxx.

To Her Highness the Maharani of Dhar, who is one of our esteemed Vice-Patrons, the Society tenders its respectful condolences.

MISCELLANEOUS NOTES

No. I.—MEASUREMENTS OF GAME ANIMALS

In the course of many visits to museums, and after inspecting hundreds of mounted heads of game animals, it has been evident that there are certain faults in mounting animals which seem to be common to most taxidermists.

1. **Body.** The sternum is not carried far enough back, so that the animal appears to have a very thin and elongated waist. The buttocks are usually made globular, no indication of the two very distinct muscles being made.

2. **Legs.** The hind legs are often badly 'cow-hocked' while both fore and hind legs are not far enough apart.

3. **Neck.** This is usually much too slender. Animals with large horns have thick necks to carry them.

4. **Muzzle.** The nostrils are not carried back at a slant but are square with the mouth. This is due to the fact that in skinning out, the cartilage of the nose is divided to remove the small muscles between the nostrils, and the taxidermist does not join it up again. The upper lip should project beyond the lower lip, and the sides of the upper lips slightly overlap the lower lips. Many taxidermists seem to forget that a lot of small muscles and cartilage are skinned out, and they place the skin of the lips direct on to the bones, thus shortening down the muzzle and making it too small for the rest of the face, giving it a sort of pug-shaped appearance.

It will be seen from 1, 2 and 3 that there is a general tendency to make an animal too thin; with, I suppose, the object of giving it a graceful, traditional 'gazelle-like' appearance. Ibex and markhor are heavy, bulky animals, while even black-buck and chinkara have sturdy necks and bodies.

I append a list of measurements of specimens of big game of sixteen species. The girths of shoulder and thigh were taken at the junction with the body. Heights at shoulder were taken by straightening the fore legs with the heels together and taking the measurement from the top of the shoulder to the bottom of the heels. The waist measurement was only taken when normal: I have deliberately omitted several measurements taken when the animal was distended with grass at the end of a morning feed. I may say that such increase of girth may amount to 5 inches in the case of quite a small animal like an oorial.

From this list, measurements of the following animals seem worthy of special note :—

1. *Kashmir Stag and Sambhar.*—Although the height at the shoulder of the sambhar is slightly greater, it will be noticed what a very much bulkier animal is the Kashmir Stag. I have shot several specimens of both and had expected to find that the Kashmir stag (undoubtedly I thought the bigger beast) would be a couple of inches more at the shoulder. The length of tail in the sambhar is noticeable.

2. *The Female Serow* (No. 12) is quite abnormal. As is seen she was bigger than the big male which carried the record horns for Kashmir.

3. *The Astor Markhor* (No. 14) and the Straight-horned Markhor (No. 16). The measurements of the Haramosh specimen are measurements of a male perhaps slightly above the average, those of the Straight-horned are of an adult male of normal size, but not quite as big as one of the three I have shot in previous years.

The measurements indicate a very different type of beast to the Haramosh specimen, and I think the Straight-horned Markhor of this area should rank as a separate species. The horns are very distinct from those of the Sufed Koh and Baluchistan, and I have never seen any variation from type, while the geographical distribution is limited and distinct.

The Sind Ibex (No. 20).—The measurements are much smaller than those usually given in books. The buck is about the same size as an oorial ram, though thicker legged and more cobby in build. The height of three other bucks averaged the same.

—	Height at shoulder	Length, nose to root of tail	Tail	Base of ear to root of tail straight	Hock to heel	GIRTHS					
						Throat	Base of neck	Chest	Middle	Waist	Shoulder
1. Kashmir Stag ♂ ...	50	88	4¾	...	...	34	42	67½	...	...	...
2. ,, ,, ♂ ...	51	87	4½	...	...	...	...	...	...	...	...
3. ,, ,, ♀ ...	42	75¾	4¼	58¾	19¼	20	27	57	64½	53	15¼
4. Sambhar ♂ ...	51½	86	12	...	...	26	40	57	...	53	18
5. Musk deer ♂ ...	24½	...	...	...	...	...	...	...	...	...	...
6. Blackbuck ♂ ...	31	49¼	5½	...	12¾	16½	20½	31½	...	30	13
7. Chinkara ♂ ...	25¾	...	...	...	...	12	15	25¾	27¾	...	...
8. ,, ♂ ...	26	42	6	...	11½	13¾	17	24¾	...	22¾	8½
9. Tibetan Gazelle ♂ ...	24	41	...	...	...	...	...	26	...	...	...
10. ,, ,, ♂ ...	25	42	...	...	...	...	...	28	...	...	...
11. Serow ♂	39½	...	...	...	...	...	...	...	...	...	...
12. ,, ♀	41	69	6	49	13¾	...	...	...	...	...	...
13. ,, ♀	36¾	60	5	42	13¼	...	...	...	...		...
14. Markhor ♂ ...	41	73½	7½	...	13	21	27	51	54	51	16¾
15. ,, ♀ ...	28½	59	5½	...	10¼	12¾	18	34¾	42	31¾	15½
16. Straight-horned Markhor ♂.	35	52	5	...	11	17	21	35½	43	...	13
17. Kashmir Ibex ♂ ...	40	...	...	55	...	...	...	48½	...	...	...
18 ,, ,, ♂ ...	39	...	...	53½	...	...	...	47	...	...	...
19. ,, ,, ♂ ..	37½	...	...	52	...	...	...	46½	...	...	...
20. Sind Ibex ♂ ...	32½	56	3¼	...	12¾	15	21	37	43	35½	13
21. Burhel ♂	35¾	54¼	...	...	...	...	...	41½	...	...	...
22. ,, ♂	34½	52½	...	...	...	...	...	38½	...	...	...
23. ,, ♂	35	54	...	...	...	...	...	39	...	...	...
24. *Ovis ammon* ♂ ...	46½	...	...	...	...	...	...	...	...	...	...
25. Oorial ♂	31½	57	4	...	...	17½	27	35	36½	31	17¼
26. ,, ♂	32½	56½	3½	...	11¾	18	27½	35¼	38½	29½	16¾
27. ,, ♀	27	47½	3¼	...	10½	10½	15	28¼	33½	27½	8½
28. Gaur ♂	71	...	...	...	...	...	...	...	...	...	...
29. Tsine ♂	65	...	...	...	...	...	...	...	...	...	...

			Depths						
Cannon bone	Thigh	Hock	Throat	Base of neck	Chest	Waist	Weight in pounds	Locality where shot	Remarks
...	...	...	...	...	...	...	...	Khru, Kashmir ...	Horns 47″.
...	...	...	...	...	...	...	...	Kishtwar ...	......
5½	22	10	7½	10	17½	15	...	Khru, Kashmir ...	Probably above the average.
6	31	12	...	14½	21½	...	...	Jaipur State ...	......
...	...	...	...	...	...	...	...	Kishtwar ...	26½″ at quarters.
3	15½	6½	6½	7½	11½	10	...	Patiala State ...	......
...	...	...	...	...	...	...	...	Hissar ...	......
2½	11	5¼	5½	6½	9	8¼	...	Patiala State ...	......
...	...	...	...	...	...	...	43	Ladakh ...	......
..	...	...	...	...	...	...	41	,, ...	......
...	...	...	...	...	..	...	...	Kashmir Valley ...	......
...	...	...	...	...	...	...	...	,, ...	An abnormally large female.
...	...	...	...	...	...	...	...	,, ...	......
5¾	22¼	9	7½	9½	18½	17	...	Haramosh ...	......
4¼	17	6¾	...	...	...	...	...	,, ...	......
4	17	7¼	6½	9	14¼	13¾	...	Kohat District ...	......
...	...	...	...	...	...	...	196	Baltistan ...	......
...	...	...	...	...	...	...	193	,, ...	......
...	...	...	...	...	...	...	188	,, ...	......
4½	19	6¾	5	8	14¼	13½	...	Khirthar Range, Sind.	......
...	...	...	...	...	...	...	131	Ladakh ...	An exceptionally big ram.
...	...	...	...	...	...	...	118	,, ...	......
...	...	...	...	...	...	...	125	,, ...	......
...	...	...	...	...	...	...	243	,, ..	......
3¾	19	7	...	...	...	...	...	Kala Chitta Range, Punjab.	......
3¾	18¼	6¾	6	10½	12½	10½	...	,, ,,	......
3	14	5¾	4	6¼	10½	9½	...	,, ,,	......
...	...	...	...	...	...	...	...	Western Siam ...	Exceptionally fine horns.
...	...	...	...	...	...	...	...	Upper Burma ...	......

Skin Measurement of Big Game

The following table of measurements of big game skins may be of interest in view of much recent controversy :—

Species	Length straight.	Length on curves.	(Skin) Pegged out.	Dressed.
	ft. in.	ft. in.	ft. in.	ft. in.
Tiger	9 3	9 9½	10 10½	10 3
Tiger ♀	8 3	8 8½	10 0	9 3
Panther	7 1¾	7 5½	8 11½	8 8½
Himalayan Black Bear	4 10		6 1	5 6
,,	5 4½		6 10½	6 6½
,, ♀	4 10		6 1	5 8
,,	5 3		6 8	6 4½
,, ♀	5 2		6 7½	6 2½
Brown Bear	4 10		5 10¾	5 5
,,	5 3		6 9½	6 4
,,	5 5		6 11	6 4½
,, ♀	5 1		6 6	6 0

It will be noticed how constant the difference is between the various skins. I have always aimed at securing a good breadth to a skin, so it is possible the lengths of the skins might have been slightly increased, but this would render even less probable the stories of gigantic tigers of 11½ and 12 feet 'as they lay'. I have yet to see a 12 feet dressed tiger skin.

C. H. STOCKLEY,

KOHAT, *Major,*

March 2, 1926. *2/1, Punjab Regt.*

No. II.—COMPARATIVE SHAPE AND MEASUREMENT OF THE FORE FEET IN TUSKERS AND TUSKLESS ELEPHANTS

There is a statement in Mr. E. L. Walker's *Elephant Hunting and Shooting in Ceylon,* p. 73, to the effect that a Ceylon Tusker elephant has a slightly oval forefoot, similar to, though not so pronounced as, the hind foot.

I have personally investigated this point; and of four captive tuskers' feet which I have examined I find that this is actually so to some extent.

Tuskers being rare in Ceylon I have only been able so far to examine four.

I find, however, that there is a difference of approximately an inch in the back-to-front as against the breadth measurement in Ceylon non-tuskers' feet also, and that in the case of the *tuskers* examined the difference is 2 to 2½ inches.

I should be very much obliged if you can inform me whether any difference has been noted in the shape of the forefoot as regards tuskers and tuskless elephants in India as the point is an interesting one.

EHELIYAGODA, CEYLON, I. L. CAMERON.
June 24, 1925.

[Commenting on the above Mr. A. J. W. Milroy, I.F.S., Deputy Conservator of Forests, Gauhati, writes :—

'I have never taken any measurements to prove that tuskers' forefeet are 'rather more elongated than those of Mukhanas, because I have always 'accepted it as a fact.

'Experienced natives will generally state without hesitation whether a track 'in the forest was made by a tusker or a Mukhana, but of course one only 'occasionally actually comes on the animal itself so they may often be wrong. 'However, they have had so many generations of experience in the tracking 'of elephants turned loose to graze and so many opportunities of seeing the 'tracks of elephants that have raided their crops, that the probability is that 'they are not mistaken.

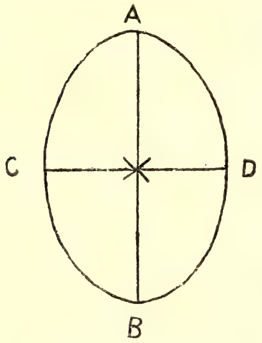
'Personally, given a distinct track, I have always been accustomed unconsciously to ascribe it to a tusker or a Mukhana, as the case might be, but 'I cannot remember to have proved definitely that I was right, though it has 'never occurred to me till the present moment that there could be any mistake 'in most cases. I will forward your letter to Mr. N. L. Bor, who will be 'conducting Kheddahs on a big scale next season, and will ask him to take 'measurements.'

Mr. Milroy has forwarded us the following letter from Mr. N. L. Bor, Deputy Conservator of Forests, Kohima, Naga Hills, Assam, in reference to the subject :—

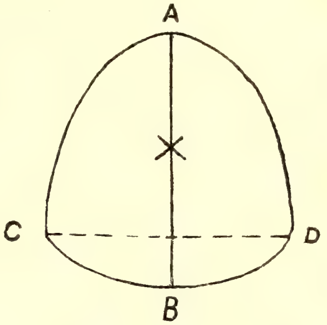
'I made some measurements last cold weather and append results. It will 'be seen that the front-and-back measurement of the feet of tusker and tuskless 'is greater than the breadth in every case.

'I do not think a study of the figures would justify one in laying down a 'definite rule as to whether the difference in the two measurements *is greater 'in the case of tuskers.*

'I think it is a misnomer to apply the term oval to a forefoot though the 'term can be applied correctly to hind feet. The greatest breadth of a forefoot 'occurs well behind the centre of the foot to back axis.'



HIND FOOT



FORE FOOT

Mr. Bor has appended a list of measurements of the forefeet of twenty-nine tuskers and thirty-five tuskless males (*Mukhanas*) the average difference between the back-to-front (A-B) and breadth measurements (C-D) in the tuskers is 1.56″, in the *Mukhanas* 1.45″. The forefoot in the largest tusker measured 1′ 7¼″, back-to-front with a breadth of 1′ 5½″ the same measurements in the largest *Mukhana* were 1′ 6″ by 1′ 2″. Eds.]

No. III.—A WONDERFUL SIGHT

Late in the afternoon of a day in January last I witnessed a wonderful sight from my observation machan over the Dod Sampagi tank in the jungle here. At 5 p.m. twenty-eight Elephants came into the tank and for nearly two hours enjoyed themselves thoroughly in the water. The biggest of the herd—an old cow—went through the most extraordinary antics, at times she would sit up like a dog and from this position she would frequently go through a motion of half standing on her head as if she was considering turning a somersault. Most of them were at one time or another completely immersed in the water except for their trunks. Two half-grown tuskers sparred with each other for a while. There were two young ones in the herd, one not more than three feet high and I should say about two or three weeks old ; the other was about four feet high—both ran in and out between their mother's legs and the smaller one seemed to spend its time stumbling into holes made by its elders' ponderous feet and making frantic efforts to scramble out of them again. One of the herd, a small cow, had a dislocated hind leg, its hip-joint being out. This caused it to walk like a ship pitching and tossing. The poor brute's leg was as a result of the dislocation much longer than the other three and to drag it out of the mud the elephant had to lean right forward. The leg seemed to be very swollen. An elephant Khedda was held on these hills last December and I think it is likely that this elephant was one of those caught, and that it pulled its leg out of joint in its efforts to release itself from its leg-ropes, and was consequently released. This is of course only a surmise. On reaching one end of the tank the herd got our wind and bunched together and then hurried away into the surrounding jungle on hearing a low whistle from me.

There is nothing more fascinating than observing Game in this tank on a moon-light night. My observation machan is large enough to allow four or five people to lie on it at full length. I recently watched a fine stag Sambhur and two does romp and wallow in the water for about three hours.

HONNAMETTI ESTATE, ATTIKAN P.O., R. C. MORRIS.
via MYSORE,
April 28, 1926.

No. IV.—TIGERS AND ELEPHANTS

When out shooting the other day, I came across the tracks of a small herd of elephants in the bed of a stream. By the tracks it was clear that there was a young calf with the herd, and when I saw the tracks of a tiger following those of the elephants, I suggested to my Burmese hunter, a very experienced old man, who has lived all his life in the jungles, and shot quite a lot himself, that the tiger was following the elephants in the hope of having the calf for dinner. He seemed amused at my crediting the tiger with so much audacity, and told me that the tiger was merely following in order to eat the excrement of the calf. He explained that the diet of the calf was milk, and that tigers looked upon the excrement as a *bonne bouche*. The idea is a nasty one, but from the point of view of natural history, it is an interesting thing in connection with the habits of tigers. I have never read of this anywhere, and it would be interesting to know whether any other members of the Society have ever heard of it.

The tracks of the elephants were a day old, and there were droppings of the adult members along the tracks, but strangely enough, there were none of the calf's. In the hope of finding some I followed the tracks for some miles, coming on places where the herd had stopped to feed for a considerable time, but no droppings were found. Personally, though no naturalist, I am inclined to believe the hunter's explanation. At any rate it is reasonable enough.

I wonder if you could get the views of some of those of the members who are qualified to give opinions on this matter?

THAYETMYO, BURMA, R. K. ANDERSON.
February 18, 1926.

[Commenting on the above, Mr. S. F. Hopwood, Conservator of Forests, Chindwin Circle, writes :—

'I was very interested in the letter from the Superintendent of Excise, Thayet-'myo. Elephants are frequently killed by tigers in Burma though it is very 'rare that a full-grown animal is so killed. This year several tame half-grown 'elephants have been killed by tigers in the Mu Division and I hear that a 'large firm of timber contractors lost a full-grown female from the same cause. 'There is nothing unusual in tigers killing elephants. What I consider to be 'much more unusual is the suggestion that a tiger could follow the tracks in 'the way a tracker tracks game. I do not believe that a tiger is capable of 'running any animal by scent like a dog or by following tracks like a tracker. 'Mr. Anderson does not say whether the tiger tracks followed the elephant 'tracks for some miles. I find it very difficult to believe that they do unless the 'elephants were changing their feeding ground and had marched for some miles 'along the bed of a large stream or along a road as they sometimes do. It is 'well known that tigers habitually use the beds of streams and roads and in 'my opinion the fact that tiger tracks followed those of the elephants was 'merely a coincidence.'

In vol. vii, p. 119 of the Journal, we published a note by Mr. A. G. Corbett, Deputy Conservator of Forests, Burma, in which three casualities among elephants due to attacks from tigers are recorded—the first was that of a two-year old elephant calf which was attacked and killed. The mother had come to the rescue but was unable to do anything and only got badly mauled about the hind quarters and was apparently driven off. The second case mentioned is that of a contractor's elephant which escaped after a severe mauling, and the third case that of a very big tusker which was similarly attacked and succumbed five days later. Most authorities agree that tigers do not find their prey by scent but depend rather on sight and hearing. *Eds.*]

No. V.—THE 'SAMBHUR' CALL OF TIGERS

May I add still another letter to the many which have appeared on this subject, not as an authority but as one who has many times heard this call during well over twenty years of almost continuous touring and residence in the jungly and out-of-the way parts of S. India and Burma.

My own view has long been that held and stated by the writer in the last Journal (Dunbar Brander), viz., that the cry is (if not actually a sex-call), a call to a mate, and that it is never a 'hunting' cry, or one of alarm pure and simple.

In the letter quoted from (Cardwell), the statement is made that 'no one who has heard it a few times could possibly mistake it with the . . . note . . . of sambhur—but my experience is that on hearing one solitary cry when one is not on the *qui vive* it is generally impossible to say off-hand *which* it is, but that once alert and listening for it the next and subsequent calls can seldom be mistaken. One's mental 'phonetic picture' of sounds depends largely upon the personal equation but I don't like the 'fook' or 'koi' spelling for any calls I have heard; the sound to me is best expressed as something between 'moop' and 'meep' (the initial consonant is probably really entirely absent), and if one tries to pronounce 'moop' with the lips pursed as for whistling, one gets, to my ear, a very fair imitation of the sound as I hear it, although of course it is quite possible that different animals, in different districts, may have a modified pronunciation, as it were.

In Lower Burma I have listened almost nightly for several consecutive nights, during the months of February to April, on different occasions, to the call at quite close quarters, and the impression given was almost as if it were of 'conversational' character, the call being quietly uttered perhaps seven or eight times while the animal was passing over say three or four hundred yards of ground, and sometimes much less, close behind the bungalow in bamboo forest.

Personally I don't think I have ever heard a call replied to, and certainly not from a different direction, though possibly sometimes they might have been more or less alternate calls by two animals in the same radial direction from one and not very far apart. On this point I can offer no evidence but the calls have always *sounded* to be by the same animal repeating its cry. Examination has never shown evidence of two tigers though here again at that season and in such ground the tracks of even one are often difficult to trace.

These nights of calling never coincided with a kill in the vicinity although over twenty kills of dudh-wallahs cattle within a couple of years took place less than a mile away.

The domestic cat has a habit sometimes of wandering about giving vent to a plaintive call or cry which in some ways is distinctly similar to the tiger cry on a small scale, and I have wondered whether perhaps the call in both cases is not so much a definite mate call as a sub-conscious, questing, complaint from an indefinite sense of loneliness; and I am inclined to think, on very slight grounds perhaps, that it is generally made by the female.

By a coincidence I was listening to and thinking over this matter of the calling of tiger, in Lower Tennasserim, two days ago and on the following day received my mail containing the December number of the Journal with the Note under discussion.

On one point I am perfectly satisfied myself, and that is that the call is not ever made as a decoy call in *imitation* of that of the sambhur, as with their acute sense of hearing it is incredible that a note or cry which is capable of recognition by such an imperfect instrument as the human ear should ever *deceive* a sambhur; although the curiosity of the deer tribe might possibly tempt an inquisitive animal to investigate the curious sound, just as one can call up barking deer with a blade of grass or bamboo held between thumbs and blown through. But as I have said, I have never known of a call being heard and followed by the find of a sambhur (or other) kill, which is negative evidence certainly, but is pertinent; nor have I heard of anyone else having noticed kill and call as being in *post or proper hoc* relation.

Mergui, Burma,
February 5, 1926.

W. R. COLERIDGE BEADON.

No. VI.—WILD DOGS IN MYSORE

I have never heard of more than one species of wild dog in India, the rufous-coloured animal, but a few days ago I came across at any rate, a variant from the usual type and should like to ascertain what authorities have to say about it.

I was on bison tracks with an experienced Curumba tracker in ordinary teak forest near the Mysore frontier, when I noticed a movement in the long grass about seventy yards off across a small ravine. I was using field glasses and, pointing out the spot to the Curumba, we saw what I at first thought was a large jackal, but it stood higher and had an independent, fierce look that no jackal ever possessed. Colour was yellowish, almost golden in the sunlight (about 7.30 a.m.) on head and shoulders, greyish-yellow body, full brush deepening into black towards the end. The Curumba whispered *Chennai,* wild dog. I was doubtful as the colour was so different to the ordinary wild dog. We crossed the ravine, the animal running up the hill and disappearing, and heard a series of chattering barks, which the Curumba said were made by these dogs. He was quite right and I saw several more in front, not more than thirty yards off, leaping up in the grass to see us better and now and again giving their extraordinary bark; I don't know what else to call it. I regret I did not shoot one or more but the bison tracks turned off to the right and I followed them.

Subsequently I gathered the following information:—

These dogs have been known to the Curumbas in the Mudumalai Forest for years and are much dreaded by them, as they are said to attack men. The Curumba does not mind the ordinary 'red dog', which is very common eight or ten miles from Mudumalai, nor does he fear tigers, etc., the ways and habits of which he understands. Asked if he knew of a case of a man being attacked, the tracker said that anyone attacked did not come back to tell about it. These dogs are reputed not to allow the ordinary wild dog in the same forest. I asked the Forest Ranger, a very intelligent man, if he had heard of more than one kind of wild dog and he said that he had been told of these by the Curumbas, but had never seen one himself and was interested to hear that I had done so. As to the colour, I have never before seen a wild dog with a black end to his brush in South India, but have read of this in North India; the lighter colour may be due to these dogs being purely forest animals and growing longer coats? Would a cross with a Mysore wolf be a possibility? I think the account of their fierceness may be accepted. The Curumbas are a jungle tribe, living amongst and thoroughly accustomed to all wild animals; good trackers and shikaries, and the man with me was a veteran whose coolness I can vouch for. As far as I know, the ordinary red wild dog does not bark; the only noises I have heard him make are a sort of whistling, apparently to communicate with each other, and occasionally whining.

Wellington, S. India,
March 15, 1926.

G. E. WINDLE,
Captain.

[In colouring the Wild Dog varies from uniform red to rufous-grey or even light brownish-grey. As regards the colour of the terminal portion of the tail—of a series of thirty-four skins obtained in India and Burma all except four have black tips to the tail including specimens from South India and Canara. Of the four white tipped examples three were obtained in the C.P. and one in the U.P. Dunbar Brander in his *Wild Animals in Central India* mentions that the white tip is much more common in the C.P. than the black. Of ten specimens in our collection obtained in the Berars and the C.P. seven have black tips and three white. It is interesting to note that, like the Curumbas of Mysore, the Nagas of the Mishmi Hills, Assam, appear to believe in two varieties of wild dogs, one of which they credit with fiercer and more rapacious qualities than the other. There are, notwithstanding, only two recognized species of Wild Dogs, the Indian *C. dukhenensis* and the Malay *C. rutilans*. The latter has never been recorded from Indian limits. It would be of very great value if sportsmen obtained skins of the two species alleged to co-exist in Mysore and South India. EDS.]

No. VII.—SOLITARIES

Writers on Indian Big Game Shooting have in the past generally led one to believe that solitary elephants and bison have become 'solitary' through being turned out of a herd. From careful observation during the last five or six years I am quite convinced that this is not the case. They turn 'solitaries' of their own free will: they arrive at an age when, for many reasons, the herd is a nuisance to them, and they get morose and desire to be alone. If it was a fact that younger bulls in the herd turned them out, this surely would apply to the rutting season more than any other period. Yet it is not denied that all solitary bulls do rejoin the herds during this season and they leave the herds as soon as this period is over. In December 1924, I watched a tussle between a magnificent old Bull Bison, undoubtedly a solitary out of the rutting season, and a younger herd bull. The former won hands down! It is inconceivable that, veritable giants of the forest as solitary elephants and Bison are, with their enormous size and strength, they should allow themselves to be turned out of a herd by smaller and less powerful bulls.

December 23, 1925. R. C. MORRIS.

[Commenting on the above note Mr. Dunbar Brander writes :—

"Writers on Indian Big Game Shooting as a rule are intent on telling the public what they did and how they did it : and although it is generally thought necessary to throw in a certain amount of information about the animal this information is frequently misleading and incorrect.

"To contradict all the misleading information supplied by writers on Big Game Shooting will prove an endless task. I am in no position to speak with any authority on Elephants. With regard to Bison I consider that the great mass of bull bison are solitary by their own choice and I am in general agreement with what Mr. Morris writes.

"The remarks made in 'Wild Animals in Central India' on this subject are as follows :—What Mr. Morris has written is a confirmation thereof.

'At this season (the breeding season) bulls which are solitary during the rest 'of the year join the herd.' 'Young herd bulls will be found with the cows at 'all times, but during the breeding season the master bulls, who lead semi-solitary 'lives drive these youngsters away. These master bulls however are of no great 'age. The really old beasts lead solitary lives, and this animal seems to lose 'all sexual instincts at a comparatively early age.'

"It will be seen from the above that to a great extent the bulls are solitary by preference. The exceptions to this are the young bulls driven out by the master bulls during the breeding season. These young bulls do not like leading solitary lives, they are seldom met with and when excluded from the herd can often be seen grazing in the vicinity—*near* but not *in* the herd. Then again it must sometimes happen that two master bulls contend for the same herd in which case one must be driven out and unless he can find another herd he has to remain solitary only during this period involuntarily. With regard to the really old beasts, I have often known these make no attempt to join with the herd during the breeding season : the master bulls which join the herd are of no great age. I was camped for some time on a stream in Chanda during the breeding season : there were four old solitary bulls on the banks of the stream which never attempted to join the herds. The same thing has been observed in other places.

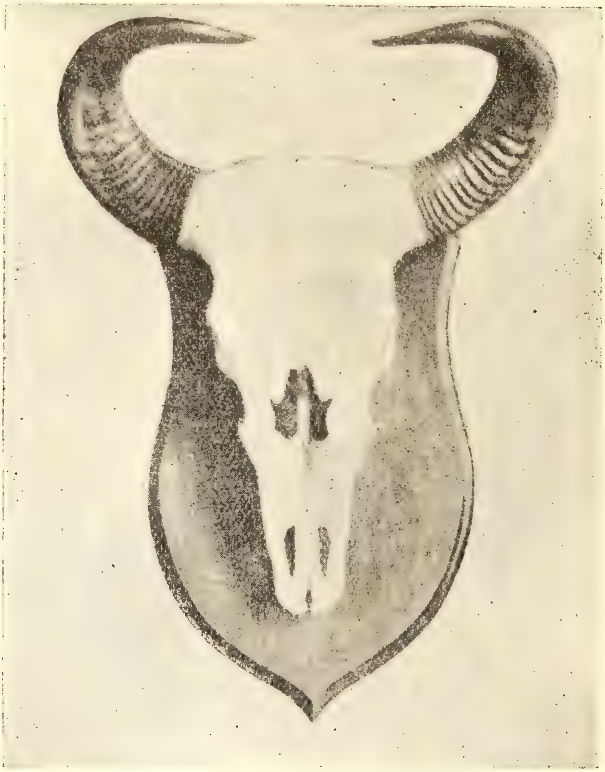
"In connection with this subject the habits of the Domestic Bull are of some interest. Stock breeders are chary of purchasing a bull unless fairly young as they cannot otherwise be certain of the bull breeding. It is not uncommon for the purchaser of a bull of say only five years of age, insisting on a guarantee that the bull will perform his duties. It is exceedingly rare for a bull of over ten years of age to be used for breeding purposes : there are reasons, it is true, besides the loss of breeding instinct which account for this, but the loss of the desire to breed on the part of the bull is a big factor in the case. No animal that I know of is comparable with the genus Bos in this respect: in fact the species of this genus with which I am familiar seem to lose the desire to breed long before they can be considered sterile in other respects.

"From the above and from what I wrote in 'Wild Animals in Central India' it will be seen that my observations and Mr. Morris' agree and the only possible difference is that I distinguish between a 'master' bull and an 'old' bull. Mr. Morris refers to a 'magnificent old bull': this beast is probably what I would define as a 'master' bull." EDS.]

No. VIII.—A SOLITARY COW GAUR

(*With a photo.*)

While after Bison on September 27, 1923, in the forest round Eindayaza in the Tavoy District (Lower Burma) we picked up the spoor of a solitary animal, a patriarchal old bull as it seemed to us at the time. We followed the trail for a couple of hours meandering in and out of the thicket, in loops and semicircles in the manner typical of the gaur. On getting into dense bamboo cover at about midday, the dogs flushed our quarry from almost under our feet, but all that we could see of him was glimpses of black as he rushed madly past. A hasty shot point blank told, and fifty yards further with the help of the dogs we came upon the animal, who tried to rise at our approach but was spared the effort by a second bullet in the neck behind the ear. A closer view of the animal, sad and surprising to relate, disclosed the fact that it was a venerable old cow. The horns, a photograph of which I append, are distinctly of the bull's formation, though more slender and with a somewhat narrow sweep. They are in perfect condition with fourteen annulations on each, all heavily corrugated.



The animal measured 5′ 9″ at the shoulder, between pegs, and appeared to be in sound healthy condition.

I do not know if it is quite usual to find solitary cows in this manner, but the Karens with me who were keen hunters and trackers of life-long experience, assured me that they had never met with a case of this sort before. It would be interesting to know if any of our members have come across a similar instance, and how this perversion of nature in the old lady may have been brought about.

BOMBAY, SALIM A. ALI.
January 29, 1926.

No. IX.—A CROSS BETWEEN AN IBEX AND A TAME GOAT

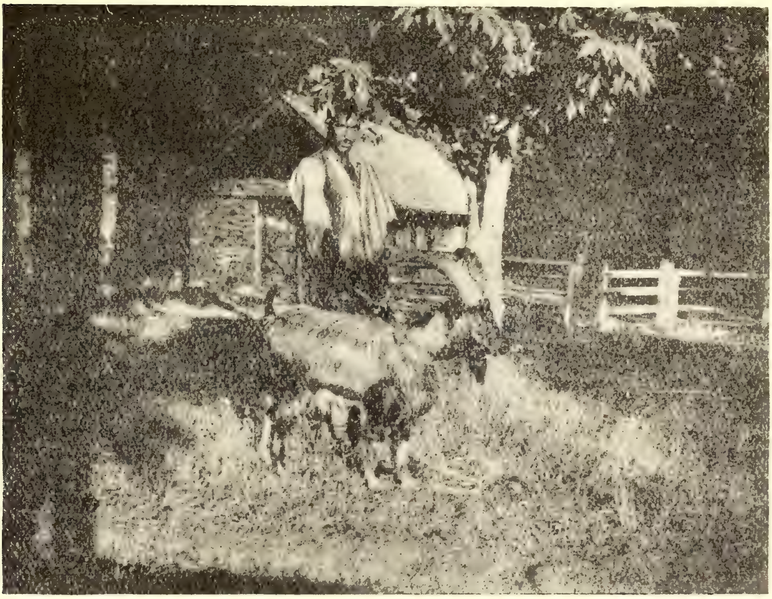
(*With a photo.*)

The photograph of this curious hybrid which was caught when young in the Kishtwar Hills when amongst a flock of Ibex, is very interesting. The horns are exactly like those of the Sind Wild Goat but are thicker and not so much curved backwards at the tips.

The colouring is much like that of the Baltistan Ibex in its summer coat. The legs of this hybrid are nearly white and the sides are whitish and dark slate.

The photograph was taken in the autumn whilst the Chenar leaves were still green on the trees, as depicted on the print enclosed.

Now in December the hair, which is very coarse, is much longer.



The animal is very sturdy and has the habits of an Ibex, it feeds on leaves, and takes dry hay and has now learnt to eat sugar beet, cabbages and occasionally takes turnips. When I first got it as a present from one of the Kishtwar Wazeers it was very wild and used to raise itself on its hind legs and attack any one who came its way.

SRINAGAR, KASHMIR, A. E. WARD,
January 1926. *Col. (Retd.)*

No. X.—THE NILGIRI TAHR (*HEMITRAGUS HYLOCRIUS*)

(With a plate.)

This interesting wild goat has a very circumscribed habitat and its range is limited to the cliffs and precipices of the Western Ghats, from the Nilgiris southwards. On the Nilgiris themselves it had become almost extinct, though in recent years strict preservation has considerably increased its numbers. The Nilgiri heads, however, run very small compared to those on the more southerly ranges. On the Nelliampathy Hills, to which range my remarks apply exclusively, herds of 60 to 90 still occur and heads up to 16″ are to be got. The record buck tapes 17½″ and doe 14″.

The Nilgiri Tahr spends its life on the open cliffs, and the feats of agility it is capable of across the face of the most terrifying precipices must be seen to be believed. A herd will gallop across or down a cliff which does not appear to offer foothold to a lizard. Where grassy downs top the cliffs, the herds will often lie upon them but seldom wander far across them and jungle is disliked intensely. It is amusing to watch a herd crossing a patch of forest, a feat which seems to be considered a most perilous adventure judging by the careful, wary progress through it. With a knowledge of these habits it is curious that an identical species should be found on both sides of the fifteen miles of flat level plain known as the Palghat Gap. What could have induced the first emigration from the southern ranges across such a great area of what then must have been forest?

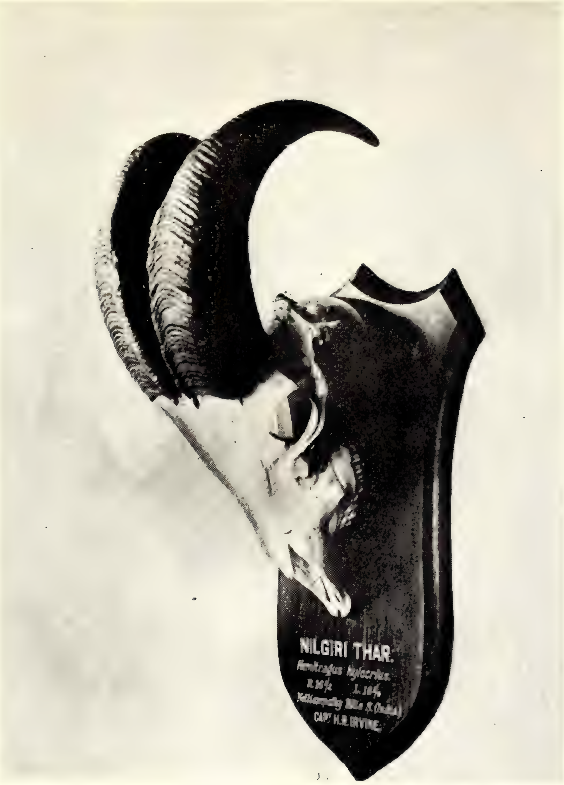
'Ibex', as these animals are generally misnamed in the south, are restless animals. Though, generally speaking, they feed in the early morning and late afternoon and lie up during the heat of the day, yet, even at noon, one individual after another will rise from its siesta, walk a few paces, brouse a while and sink down again to rest, while the kids are eternally playing, butting each other, frisking about and generally refusing 'to lie still and go to sleep'. While a herd is supposed to be resting, one or more does will be noticed as having posted themselves as sentries and extraordinarily effective watchers they are against any danger coming from below or from their own level, but an enemy approaching from well above them has them at his mercy. I have seen a panther, and on another occasion a tiger, watching a herd graze up towards his ambush. Once they got within reach : one spring and the herd was scattered leaving one of their number behind. Similarly, provided the sportsman is well above his quarry, he can fire several shots at his leisure (should his first miss) before the ibex decides where to run to. Once he does start however, it is at incredible speed considering the ground.

Nilgiri Tahr may occasionally have two young at a birth but one is the rule. Kids are dropped most commonly in the early hot weather. During the heavy rains of the South-West Monsoon the tahr generally move down the cliffs to a lower elevation, ascending to the higher cliffs again with fine weather.

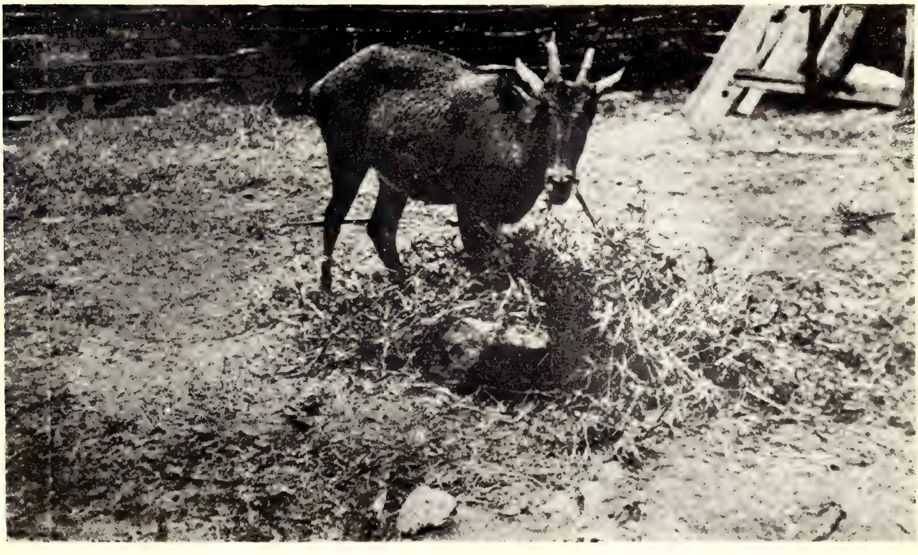
Old bucks desert the herds in the hot weather as a rule, and live a bachelor existence. In fact they are found more often solitary than accompanying the herds. In colour the does are light grey and the bucks, as they age, assume a very deep brown, almost black, coat with the well-known saddle on the back almost white : from a distance indeed this distinctive mark looks perfectly white. The bucks, which stand about 3½ feet high at the shoulder, are far heavier and stockier animals than the does, and except in the case of very young males, their build alone is sufficient to differentiate the sexes. The eye is bright golden-yellow.

Nilgiri Tahr shooting is absurdly simple provided that the sportsman approaches the animals from *above* and that he has a good head for heights. The ground they live in provides the only thrills in this branch of 'Shikar' but these thrills are very real and far from free from danger. A man who has *not* got a really good head for heights and who is likely to become unnerved at having to clamber down an almost perpendicular rock-face by his fingers and toes, with the world opening out like an aeroplane photograph 3,000 feet sheer below him had better try for other game. This is no exaggeration as any one who knows the Nelliampathy Ibex country will certify.

Panthers levy the heaviest toll on the herds but tigers not unfrequently visit the cliffs on a dinner of ibex intent, which sounds unlikely but is nevertheless true.


NILGIRI THAR.
Hemitragus hylocrius.
R. 16½ L. 16¼
Nelliampathy Hills S. (India)
CAPT H.R. IRVINE.

A GOOD HEAD IN THE SOCIETY'S COLLECTION, R. = 16½″; L. = 16¼″



YOUNG FEMALE NILGIRI TAHR

Wild dogs do not stand much of a chance of a successful hunt on this ground and I doubt if any tahr fall to them on these hills.

The Poacher accounts for a good many head on the lower and more accessible cliffs, the meat, locally supposed to possess medicinal value, being the attraction.

The flesh of the doe is delicious but the intolerable smell of the buck would turn any but the most hardened stomach from any gastronomical experiments in that direction.

One uncomfortable habit (from the shikari's point of view) frequently indulged in by saddle-backs, unless shot dead, is to hurl themselves into space in their death struggle, and the trophy when retrieved after its 3,000 feet fall is thereby apt to be ruined.

Young tahr make delightful and most amusing pets, but as they grow up their horns, in play or anger, are capable of inflicting a serious wound. A friend of mine has a tame doe which recently neatly skewered his cook through the thigh, causing a nasty sore which took a long course of hospital treatment to cure.

NELLIAMPATHY, A. P. KINLOCH, F.Z.S., M.B.O.U.
February 17, 1926.

No. XI.—THE 'CLICKING' OF THE MUNTJAC (*M. VAGINALIS*)

In volume xxx, No. 3, page 694 of the Journal, Mr. Ralph C. Morris refers to the rattling or clicking noise heard by himself and others, from Barking Deer. I have had several opportunities of hearing a kind of rapping sound from this animal, before being able to find out how it was produced.

One day I was sitting up in a place in the Ghat Forests near Lonavla, where I knew Barking Deer had the habit of moving. It was during the hot weather, and I must have been dozing, when I was roused by a rapping just behind me. I was sitting on a large stone, with my back to the trunk of the tree, large enough to hide me completely, as long as I kept quiet. As I soon recognized the sound as coming from 'Bhekar' I waited, in the expectation that the animal would slowly stalk away through the undergrowth and give me the chance of a shot. However, he was putting my patience to a trial and went on rapping, at intervals, evidently without moving. The sound was such as might have been produced by knocking together two dry sticks, once or several times. After a while I could not master my curiosity any longer. Bending slowly to the left and turning my head backward I could get a good view of the Deer. His head was slightly turned away from me, so he did not notice me. And now I could clearly see that the rapping was produced by the Deer striking the ground (or, more likely, a root or a stone) sharply with the hoof of his right foreleg. Evidently, he had not advanced since he started his performance, nor did he budge from the place during the short time during which I could observe him. I was in a very uncomfortable position, and when trying to improve it I must have frightened the animal, which bounded off with a sharp bark, which he repeated when he came to a stop in the dense undergrowth, perhaps thirty yards away. As he evidently had not seen me I resumed my former position and kept still. After about a quarter of an hour the animal approached again, this time a little from the left, and I could get an easy shot at him.

What prompts the Barking Deer to rap? It may be curiosity or alarm. Barking Deer usually move through the Forests in pairs, at some distance, and the experience I have given an account of above, might justify the conclusion that the animal scented danger and wanted to warn his mate.

As Mr. Morris calls the noise a clicking or rattling it is possible that he refers to a sound which is different from the one I have tried to describe. I may, however, say that the rapping sound will vary according to the ground, or object on the ground the animal's hoof strikes upon.

DELHI, MAX FREI.
February 15, 1926.

No. XII.—MEASUREMENTS AND WEIGHT OF A MALAY TAPIR

A recent copy of a report on the post mortem examination of a Malay Tapir which died in the Zoo at Karachi gives the measurements and weight of the animal as follows :—

Length	84 inches.
Height at shoulder	44 ,,
Girth	68 ,,
Weight	1,200 lbs.

The post mortem examination revealed that the animal died of Gastro-enteritis and a considerable quantity of sand and small pebbles were found in the small intestines.

Bombay Natural History Society, S. H. PRATER, C.M.Z.S.
February 2, 1926.

No. XIII.—THE OCCURRENCE OF THE PINK-FOOTED GOOSE (*ANAS BRACHYRYNCHUS*) AND THE MALLARD (*ANAS BOSCAS*) IN JAIPUR, RAJPUTANA

The occurrence of the following birds in Rajputana may be of interest, particularly as I see Stuart Baker mentions the Mallard as being scarce in Rajputana and the Pink-footed Goose has occurred only sparingly anywhere :—

On a jhil in Jaipur territory, the following were shot on December 27 :—

One Pink-footed Goose (*A. brachyrynchus*). (The only one seen, a single bird came to one of the butts.)

Three Mallard (*A boscas*). (Large number seen, at least fifty on the jhil.)

The Bar-headed Goose was there in thousands.

I also noticed the following birds :—

Common Flamingo (*Ph. ruber antiquorum*). One flock of six. (Two adult in pink plumage, four immature white plumage).

White Pelican (*P. onocrocotalus*). Flock of ten.

Dalmatian Pelican (*P. crispus*). Two only.

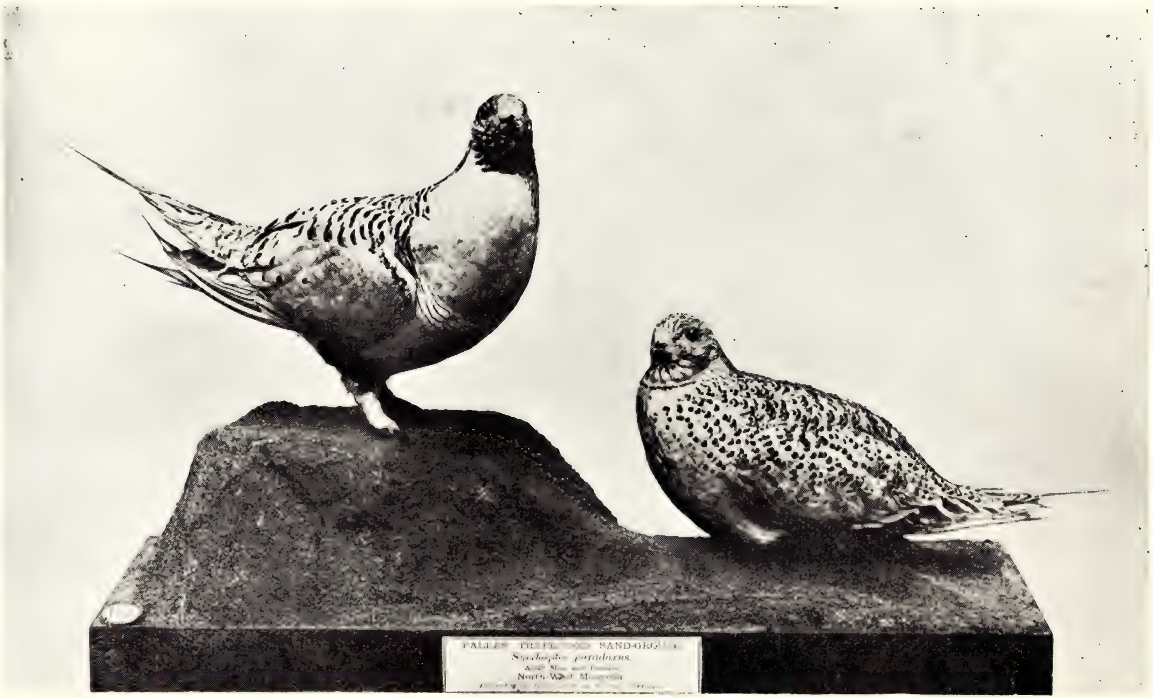
Ajmer, Rajputana, W. M. LOGAN HOME,
December 31, 1925. *Major.*

No. XIV.—ON THE OCCURRENCE OF PALLAS' SANDGROUSE (*SYRRHAPTES PARADOXURUS*) WITHIN INDIAN LIMITS

(*With a plate.*)

An example of a female Pallas' Sandgrouse (*Syrrhaptes paradoxurus*) was forwarded to the Society by H. H. Shree Sadul Singhji Bahadur, Maharaj Kumar of Bikaner. It was shot at Gujner, Bikaner State, on December 31, 1924 and was identified by Mr. Stuart Baker, who very kindly arranged with the British Museum to provide the photo illustrating the note. Dresser in his *Palaearctic Birds* states that Pallas' Sandgrouse inhabits the steppes of Southern Russia and Asia, east to North China, north to Lake Bikal; he writes, 'Large flocks have visited Europe at uncertain intervals and it has been obtained in almost every country, while it has bred in Great Britain and Denmark'. The present is, as far as we are aware, the first authentic record of its occurrence in India. Like the Tibetan Sandgrouse (*Syrrhaptes tibetanus*), Pallas' Sandgrouse has completely feathered toes and tarsi; while the hallux or hind toe is entirely wanting—it can be distinguished from its Tibetan congener by the possession of a large black patch on the abdomen. In habits it is said to resemble other Sandgrouse. The food consists of seeds. The call note which is uttered on the wing is described by Dresser as a loud *truck turuck truck turuck*. The nest is a mere depression in the soil sometimes lined with a few grass bents, and the eggs, three in number, are deposited late in May or early in June; in colour they are stone-buff, often with a greenish tint, marked with purplish-brown shell-blotches and dark-brown surface spots. They measure about 1.69×1.16 (Dresser).

Bombay Natural History Society, S. H. PRATER, C.M.Z.S,
April 15, 1926.



PALLAS' THREE-TOED SANDGROUSE (*Syrrhaptes paradoxurus*).

No. XV.—THE OCCURRENCE OF THE GIANT HERON (*ARDEA GOLIATH*) IN THE KHULNA DISTRICT, BENGAL

Blanford writing on the distribution of this Heron states that its occurrence in India is remarkable and somewhat mysterious. He mentions a few records of its having been obtained in the Calcutta Bazaar (1845-1846) by Blyth, of two shot in 1878 and another in 1879 and a third seen there in 1880. It is interesting to record that a Giant Heron (*Ardea goliath*) was presented to the Society in December 1925 by Mr. L. R. Fawcus. It was shot by him in the Khulna Sunderbuns, Bengal, where according to Mr. Fawcus it is not 'uncommon'. The following are the measurements :—

Bill from angle of forehead feathers, 205 mm. ; wing, 580 mm. ; tarsus, 235 mm.

BOMBAY NATURAL HISTORY SOCIETY. S. H. PRATER, C.M.Z.S.

No. XVI.—THE ROCK HORNED OWL IN KASHMIR

(*With a photo.*)

This fine owl, which is nearly as large as the Eagle Owl of Europe, is not uncommon in the valley of Kashmir frequenting steep rocky hillsides between 5,000 and 6,000 feet altitude.

They spend the hours of daylight sitting on some rock on a more or less precipitous rocky hillside protected from the direct rays of the sun. About half an hour after sunset they begin to get on the move, and to call. Their call is a loud 'Hoo'—slightly drawn out, but still a single note and not disyllabic as stated in the F. B. I. Birds.

This call is also heard frequently in the very early dawn.

The food of this owl judging from the large number of 'casts' I have examined in Kashmir, consists almost exclusively of rats, and perhaps five per cent of the musk rat or rather musk shrew. Breeding commences early in March, holes or sheltered cavities among rocks on steep or precipitous hillsides being used as nesting sites.

Three is the full complement of eggs laid which are broad ovals, pure white of course, measuring about 60×46 millimetres.

The chief enemy of this owl during incubation is the jungle crow. I was fortunate enough to catch one red-handed—so to speak. He had just perforated one egg out of three when disturbed by me. In another case a single egg, the first laid was similarly destroyed. The birds use the same nesting sites year after year. The enclosed photograph of three young owls in their nest on the Takht-i-Sulieman (Srinagar, Kashmir) was taken on May 6, when the young were about three weeks old.

The remains of two large rats may be made out to the right and left in the foreground.

SRINAGAR, KASHMIR, B. B. OSMATSON.
February 1926.

No. XVII.—MATING HABITS OF THE COMMON KITE (*MILVUS MIGRANS GOVINDA*)

The following are some notes from my diary with regard to the breeding of our Common Pariah Kite (*Milvus migrans govinda*) which might prove interesting. The observations mainly extend over the breeding season of 1925-1926 which still continues

In the preceding season (1924-25) the first date on which a pair were seen in copulation was October 11, and the last February 2.

In the current season I have been enabled to note happenings more carefully as, close to my window at Chowpati, there are a number of cocoanut palms which are extensively patronised by the kite fraternity of the neighbourhood for nesting purposes. There is one pair in particular which has appropriated a particular palm nearest my window, and whose operations I am going to record. I do not find any reason to doubt the identity of this pair because, as far as I have been able to observe, pairs take up definite quarters, for instance one pair is always to be seen near a particular spot on the ridge of Wilson College roof, another has established itself on a palm farther away from my window, and so on.

Copulation was first noticed on September 13. On December 29, the following note appears in my diary: 'Copulation among the kites continues generally. The act is performed many times each day. Have not been able to determine so far a full day's number, but by 10 in the morning, before leaving for office, have frequently observed it from three to six times. The birds usually return to the same neighbourhood for the act time after time, and very often the female does not leave her perch in the interval at all. The male bird alights on her back from the air, and balancing himself by flapping his wings, flies off directly the act is completed. The female whistles in a particular manner when wishing to attract her mate, and the cock bird keeps up a series of distinctive short, sharp, crescendo whistles or 'screams' which end up abruptly when the act is over.'

On January 21, I noticed this pair busying themselves with nest construction for the first time, but copulation appeared to continue simultaneously with this. On January 31, I thought a marked decline in the number of times per day was noticeable, and this I ascribed to the increase in the actual nesting activities; in this however, I was deceived, for on February 6, my diary has the following: 'Copulation still continues as before. Usually the act takes place three or four times of a morning' and another note on the seventh says, 'The pair were seen to copulate seven times to-day; five times before noon and twice after 5.30 p.m.' This was a Sunday and I was thus enabled to keep a full day's record. On February 13, copulation was observed at 6.45 p.m. just as dusk was setting in. It is February 18 to-day, and copulation still continues though the frequency is somewhat diminished, *I think*, and the birds at last seem more preoccupied with nest building.

It is astonishing to find this extraordinary protraction of the mating period. Moreover, from September 13 (when the pair were first seen copulating) until

January 21, or say the middle of January, the birds appeared to give no thought to the building of a nest, and it would seem that the idea of bringing up a family had never occurred to them all this time.

The astounding sexual capacity of the birds and the period over which the mating operations continue, surpasses anything known to me in this line with undomesticated animals, and the capacity of the lady kite in particular tends rather to put one in mind of a notorious Queen of Aragon who had certain very original notions on the subject.

SALIM A. ALI.

BOMBAY NATURAL HISTORY SOCIETY,
6, APOLLO STREET,
February 18, 1926.

[Commenting on the above Mr. C. H. Donald writes :—

"The note, I think, is of considerable interest in showing how very often these birds can copulate without apparently any result. Of course, it is not uncommon to see these birds going through all the actions at odd times but whether they actually do the deed, or not, is very difficult to see.

"I am afraid I can shed no light on the subject as I have never taken any special note of it, but I cannot see how they can go on copulating half through the year without producing any result, unless there is something wrong with one of them. I think this note would be of greater value if the writer could continue his observations a little longer and let you know the result, i.e., if they succeed in bringing up a family in the end."

Mr. H. Whistler considered the incident as abnormal. He writes, 'I have not come across such a case, and it would not normally occur, as the organs in a male bird are usually in a quiescent state and merely enlarge temporarily at the beginning of the breeding season. Presumably pairing does not take place ever until the organs have enlarged and stimulate the male to action.'

The question arises however, as to whether the breeding season had not already commenced when these observations were made. In Bombay the normal breeding season commences early in October.

Asked to continue his note in the light of further observations, Mr. Salim Ali writes on May 16th as follows :—

"I give below notes from my diary in regard to the copulation of the pair of kites subsequent to the 18th of February :

Feb. 21 "Copulation has become markedly less frequent."

Feb. 24 "Pairing has practically ceased, though it does still take place occasionally."

Feb. 28 "Witnessed pairing. This has now become very infrequent.

"After the above I have no further record, and the mating would therefore appear to have ceased from this date. The pair now took up the work of collecting material for the nest in right earnest. Building commenced in the same palm and a good deal of 'screaming' (quite distinct from the 'screaming' in copulation) accompanied the operations. Crows evidently proved a great nuisance and it was a common sight to see one of these rascals being assailed and chased away from the vicinity by the infuriated owners.

"Unfortunately, before much progress had been made with the nest, the whole thing was pulled down by a toddy-drawer who climbed the tree regularly, and further attempts of the birds met with the same fate. After three or four misadventures in this manner, the pair left the locality and I did not notice them making further endeavours. They were still casually to be seen in the neighbourhood, but for nesting they probably found a safer haven elsewhere. In fact, I am not certain if they eventually did succeed in bringing up a family at all. One particular I omitted to mention in my previous note was that during the act, and while the male was on the female's back and emitting the short sharp "screams" to which I have referred, the female very often turned her head back to look at him, bringing her bill quite close to his. I was reminded of this by a note I was reading the other day on the "Courtship and Sexual Habits of Birds" (*Ibis,* Series xii. vol. i (1925), p. 889) where writing of the Oyster Catcher (*Hæmatopus ostrelegus*) J. S. Huxley observes as follows :

" 'During the time the cock is on the hen's back, she may turn her head right round to look at him, and on one occasion I thought their bills touched." ' This remarkable similarity in the behaviour of birds of such widely divergent species is interesting indeed.

"Referring to the period which may elapse between the actual union and the laying of the eggs, Huxley observes the following on p. 893 which I quote *in extenso,* to show that the facts recorded by me, are not altogether abnormal, although it must be admitted that the period during which copulation was carried on by the kites was a very considerable one.

"In Warblers buntings, etc., " 'The hen appears to pass through two distinct phases—one in which she seeks the territory and company of the male, the second in which she will copulate. This separation of phases does not occur in the Oyster Catcher, although it is clear that unions achieved in March can have no physiological effect on the fertilization of eggs not laid till after April 25, i.e., in Oyster Catchers the physiological capacity of the eggs to be fertilized is not synchronous with the physiological readiness for insemination, while in Buntings the two are closely linked—an interesting difference. I have evidence that the Crested Grebe resembles the Oyster Catcher in this respect. . . . It had best be styled the 'pre-incubation period' ". EDS.]

No. XVIII.—BRAHMINY KITE (*HALIASTUR INDUS INDUS*) SWIMMING

Three or four Brahminy Kites, all young birds, were flying over a small dock situated opposite my house picking up refuse floating in the water, when suddenly one of them in making a swoop flopped down on the water. It seemed in no way disconcerted but rode the water easily, swimming like a duck. After the space of a minute or so, it rose rather awkwardly and rejoined its companions.

Mr. H. B. Tilden, with whom I discussed the incident, has made a similar observation and has sent me the following note :—

'On a voyage from Karachi to Bombay per s.s. *Chakla,* while anchored off the port of Porbandar on the 21st instant, I observed a Brahminy Kite (which had been hovering round the ship in company with several sea gulls) take to the water gracefully and swim in quite a choppy sea for at least five minutes. He then rose into the air with the ease and grace of a sea gull.

It occurs to me that this is an unusual proceeding especially as I saw a Common Pariah Kite (*Milvus govinda*) drowned in Madras harbour. In stopping for food thrown overboard the s.s. *Modasa,* the kite struck a wavelet and apparently could not take to the air again. She swam or rather beat the surface of the water with her wings for quite half an hour and progressed about 50 yards to the ship's side.

We passed a stout rope, with knotted loops, overboard but the unfortunate kite was too exhausted to take hold and just as a lascar was about to climb down to the rescue the kite sank.'

BOMBAY NATURAL HISTORY SOCIETY,
6. APOLLO STREET,
May 1, 1926.

S. H. PRATER, C.M.Z.S.

No. XIX.—AN ALBINO BUSTARD (*EUPODITIS EDWARDSI*)

On January 30, 1926, at a spot about eighteen miles, N.W. of Kutch Mandvi, on an open and barren tract of country, I saw a flock of nine bustard. One of these was a pure white—apparently as white as an egret—and was clearly visible from a long distance, long before the others were distinct. I tried for a long time to get within range but owing to the openness of the ground and the number of the flock, I could not do so. I should be glad to know if such albinos have been noticed before. I myself had never heard of nor seen one till this occasion.

BHUJ CUTCH.

VIJAYARAJJI.

[In January this year we received from the Maharaja of Dhar an Albino Coot (*Fulica atra atra*). Albinism was not complete and there was a considerable mixture of black feathers among the white which gave the bird a speckled appearance. The feet and bill were fleshy white and the iris pale blue. In complete albinos the pupil and iris are red owing to the blood vessels shining through the otherwise strongly pigmented parts. When albinism is partial it may mean a general deficiency in the pigment available or a disturbance in the normal blood supply of a certain area of growing feathers. A lesion of the pulp of a growing feather not infrequently prevents the deposition of the normally present black pigment in the feathers and other parts, but the pulp may recover after one or more moults and normal colouration be assumed. EDS.]

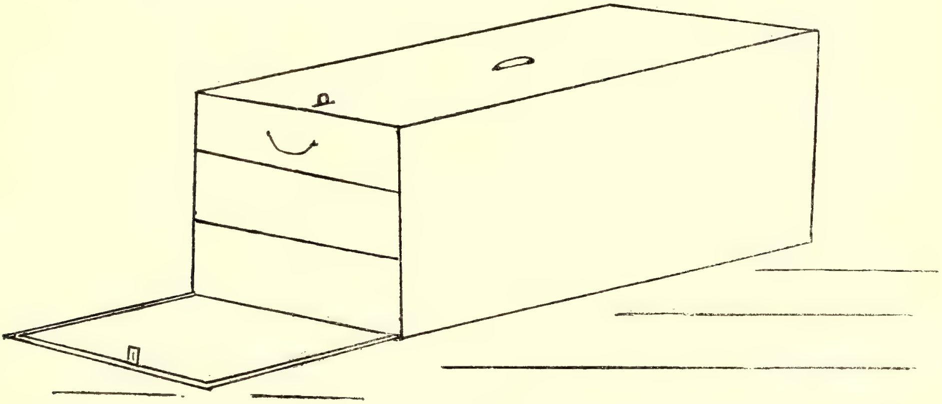
No. XX.—THE TRANSPORT OF BIRDS' EGGS

(*With a text figure.*)

Carrying eggs about India, where one, so to speak, moves with one's house on one's back, is not an easy matter, so possibly the method I employed may be of use to others, who may be experiencing trouble; anyhow I give it for what it is worth.

In 1895, I was quartered at Baroda, where I had the privilege of making the acquaintance of Professor Harold Littledale. Though probably unknown to the present generation, he was then one of the foremost sportsmen in the land, in every way. Like myself, he collected eggs and initiated me into the method I now write of and which I have found most successful. Should this article, by any chance, come to his notice, I hope he will forgive me for writing about his inventions.

To commence with, get an ordinary kerosine tin: have one end removed and converted into a lid, on a hinge, and a clasp to close it. Then, have trays constructed of tin with lids (either all hinges or removable) to fit into the kerosine tin easily, so that they can be drawn out without force. These trays should be made in three *depths*. For big eggs, three trays to a tin, for medium size four trays, for small eggs five trays. A small loop or handle should be made to each set of trays to facilitate withdrawal. Each kerosine tin would, also, have a handle to carry it by.



Kerosine Tin containing
3 trays suitable for big eggs

Any tinsmith, in any bazaar, can make these things without difficulty. Having got your tin with trays ready, cotton wool or wadding should be placed at the bottom of each tray. In these the eggs, for transportation, should be wrapped up, separately, in wool and packed, while, on the top of all, another layer of wadding should be placed. Eggs, thus packed, will travel, with the utmost safety.

Eggs can also be shewn off to great advantage, when not travelling, in these trays, by removing them out of their wrappings and placing them in clutches, separated by a little wool, paper, etc.

Another advantage of this system is that one can put one's hand on any clutch in a moment, as follows. Kerosine tins should bear Roman numbers, thus I, II, III, etc. Trays ordinary, thus 1, 2, 3, 4, etc. Eggs should be packed in them by variety and a record kept. For instance, the eggs of *Corvus splendens* are packed in tray 7, box III. A record should be placed against it thus :—III. 7. All that is necessary, should you wish to look up *Corvus splendens* are packed in tray 7, box III. A record should be placed aid is to place a slip at the top, in each tray, showing, by clutches, the eggs it contains, thus *Corvus splendens* 4. 4. 5. 3. *Corvus corax* 4. 3. 3. 5., etc. This also gives a census of all eggs.

To move your tins, wooden boxes to hold 4, 6, 8 or any number to suit your convenience, can be made.

For use in the districts, shooting or other expeditions, the ordinary kerosine wooden case holding two tins is recommended. A lid on hinges, with a fastener is easily made. This is a load that can be easily carried by a coolie or placed on a mule, pony, yak, etc.

I have found the above method very satisfactory. It is simplicity itself. Kerosine tins can be obtained almost anywhere in India, as also the tinsmith and sutár to do the necessary.

Jamaica, *B. W.* 1., R. M. BETHAM, M.B.O.U.,

No. XXI.—EARTH SNAKE (*SILYBURA SP.*) AND CHICKEN.

Last month while proceeding, accompanied by my mother and sister, to call on a neighbour, we came across a young fowl, lying helpless in the middle of the road, with an earth snake (the common *Silybura*) wound tightly, in several loops, round both its legs, which were so tightly tied together that it took me several seconds to disentangle the knot and release the bird. Did the chicken take the snake for a particularly juicy worm? But how did the snake get so firm a grip round both legs? And why would it not let go? Had I not had witnesses with me at the time, I should hesitate to record a fact to me so incredible.

Nelliampathy Hills, A. P. KINLOCH, F.Z.S., M.B.O.U.
January 1, 1926.

[The power to coil itself tightly round an object has so impressed the natives that in some parts of the Western Ghats, as at Mahableshwar where the Earth Snake (*Silybura macrolepis*) is common, the belief is held that were one of these snakes to coil round one's finger amputation would be the only means of ridding oneself of it! Eds.]

No. XXII.—AN INTERESTING ENCOUNTER WITH A COBRA

While motoring into Mysore the other night, my search light picked up a snake lying in the middle of the road, which I took to be a Russel's Viper, and I promptly steered the car, so that both the front and the back wheels went over it. I was travelling at some speed but pulling up as soon as possible, I switched over the searchlight to the rear, and backed the car to see what had happened and saw the snake lying still. Imagining the heavy car had killed it, I steered close by when, to my surprise, the snake reared up with expanded hood and struck the wheels in a most vicious manner. I now realized, I was tackling a cobra and an unusually a large one at that! The snake started to move across the road, and I once again went over it, slowly this time, and distinctly felt the front wheel go over, and I am sure, the back followed suit. It did not, however, seem to harm the snake much as, when I looked back it was still moving, so I promptly reversed the car and as I tried to get the back wheel over it, it reared up once more with distended hood and struck repeatedly at the wheel which just missed it; but my front off side wheel caught it squarely as I gave the necessary swing and I felt the wriggling of the snake on the steering wheel, as it appears to have got entangled in the spokes and drawn back a yard or two, At this critical moment the head lights went out owing to a faulty switch contact, which I had to push into place and just in time to see the cobra get off the road and crawl into the bushes alongside it where I could not follow in the car nor, did I think it advisable to investigate matters further on foot. One would have fancied that a heavy car of this type, a Six Cylinder Buick, would have crippled, if not killed, the snake; but, beyond appearing a bit sluggish in its movements, it did not seem to have been hurt seriously.

Mysore, WILLIAM H. THEOBALD.
March 17, 1926.

No. XXIII.—THE OCCURRENCE OF THE BUTTERFLY *APPIAS INDRA* VAR *ARISTOXENUS* IN THE NILGIRIS

As it may be of interest to some members of the Society I beg to report the capture in February 1925 in the Nilgiris at about 4,500′ of a O *Appias indra* corresponding to the form '*aristoxemus*' figured on page 50 of the plates of 'The Rhopalocera of the Indo-Australian Faunal Region' Seitz, which flies in the mountains of Formosa.

I have also caught a few females of '*Statilia*' which have a kind of earthy brown under surface very similar to the form '*thrasia*' figured on the same page and which also flies in Formosa.

Coonoor, S.I., J. FLORENCE.
March 27, 1926.

[Commenting on the above Col. W. H. Evans writes :—

'*Appias indra shiva*, Swin. is the correct name for the South Indian race of *narendra*, M : the name *Statilia* Fruh, designates the more heavily marked wet season form. Wherever it occurs *indra*, as well as the other members of the genus *Appias*, is extremely variable more particularly in respect of the colour below and the extent of the black margin above. The variations mentioned by Mr. Florence are normal.' Eds.]

No. XXIV.—ON *PSARA PHŒOPTERALIS* AS A PEST ON GRASSES IN SOUTH INDIA

(*With a plate.*)

INTRODUCTION

It is highly probable that many of the minor pests the Entomologist is confronted with are kept in their present status by the combined action of various little known factors which serve to bring about what is vaguely termed as the balance of life. At any time any of these minor pests may turn out to be formidable enemies of crops, if by chance the equilibrium is disturbed by the disappearance of one or more of these factors. *Psara phœopteralis* presented a remarkable instance of such a change of status in the year 1924. In November of that year it was noted by the junior writer to be one of the pests concerned in the destruction of fodder grasses in Ernad Taluk, Malabar. It was subsequently found that *Psara phœopteralis* was present also at Coimbatore at that time though not in such large numbers as to cause alarm. Under these circumstances it was felt expedient to study its life-history and binomics and in the present paper a short account of the observations made is presented.

Life-history

The Imago.—This is a Pyralid moth a little over 10 mm. in length and with a wing expanse of 25 to 30 mm. It is dark fuscous in colour with a prominent spot on the forewings. It is very much like *Psara licarsisatus.*

The Egg.—It is creamy white in colour and almost oval in shape. It is moreover somewhat convex in shape being deepest at the centre and thinner towards the margins. The egg is about 0.25 mm. long and 0.2 mm. broad. Eggs 300 to 500 in number are generally laid on the food plants but in captivity the female moth readily laid eggs on the sides of glass jars. Eggs are generally found in clusters varying from 5 to 25. It takes four to five days for the eggs to hatch. The egg acquires a reddish tint about the middle after a day, making thereby the beginning of development of the embryo. After four days the young larva could be seen lying curled up inside the egg shell. Soon it tries to move about and after travelling round inside the shell many times over it breaks its passage out with the help of the mandibles.

The Just Hatched Larva.—This has its head and prothorax black and the rest of the body pinkish red. The cephalic and the prothoracic shields are markedly well developed. The body bears dorsally and laterally tufts of short fine hairs which arise from warts. The just hatched larva is 1.25 mm. long. After escaping from the egg shell it wanders about and gets attached to a grassblade. It then makes a webby shelter at the base of the leaf blade and feeds by scraping the tissues from the leaf. At this stage it has a curious habit of curling itself like a millipede when disturbed. At the end of three days it undergoes its first moult.

Second Instar.—The larva after the first moult changes from pinkish red to light pink colour. Now it is about 2.5-3 mm. long. The second instar lasts three days.

Third Instar.—The colour of the larva changes from light pink to light green. The larva is 6-8 mm. long. The third instar lasts three days.

Fourth Instar.—The colour changes to green and the warts become thickened The larva is 14 mm. long. The fourth instar lasts two days.

Fifth Instar.—The larva is dark green in colour. It is 20-22 mm. long. When ready to pupate it is about 25 mm. long and somewhat stout. The hairs are very prominent.

Pupa.—It is dark brown in colour and is 10 mm. long. Pupation takes place on the surface of the soil at the base of the food plants, the cocoon being made of silk and excreta. Pupal period is seven days.

FOODPLANTS

The pest was noted on *Panicum javanicum, Panicum miliaceum, Andropogon annulatus,* and *Cynodon dactylon.* It is probable it may feed on any common grass. In one instance it was reared from wheat.

DISTRIBUTION

Malabar, Coimbatore, Bangalore and Bellary.

NATURAL ENEMIES

A single specimen of an Ichneumon parasite, *Syzeuctus annulipes* (see Fig. 7) was one reared from a larva.

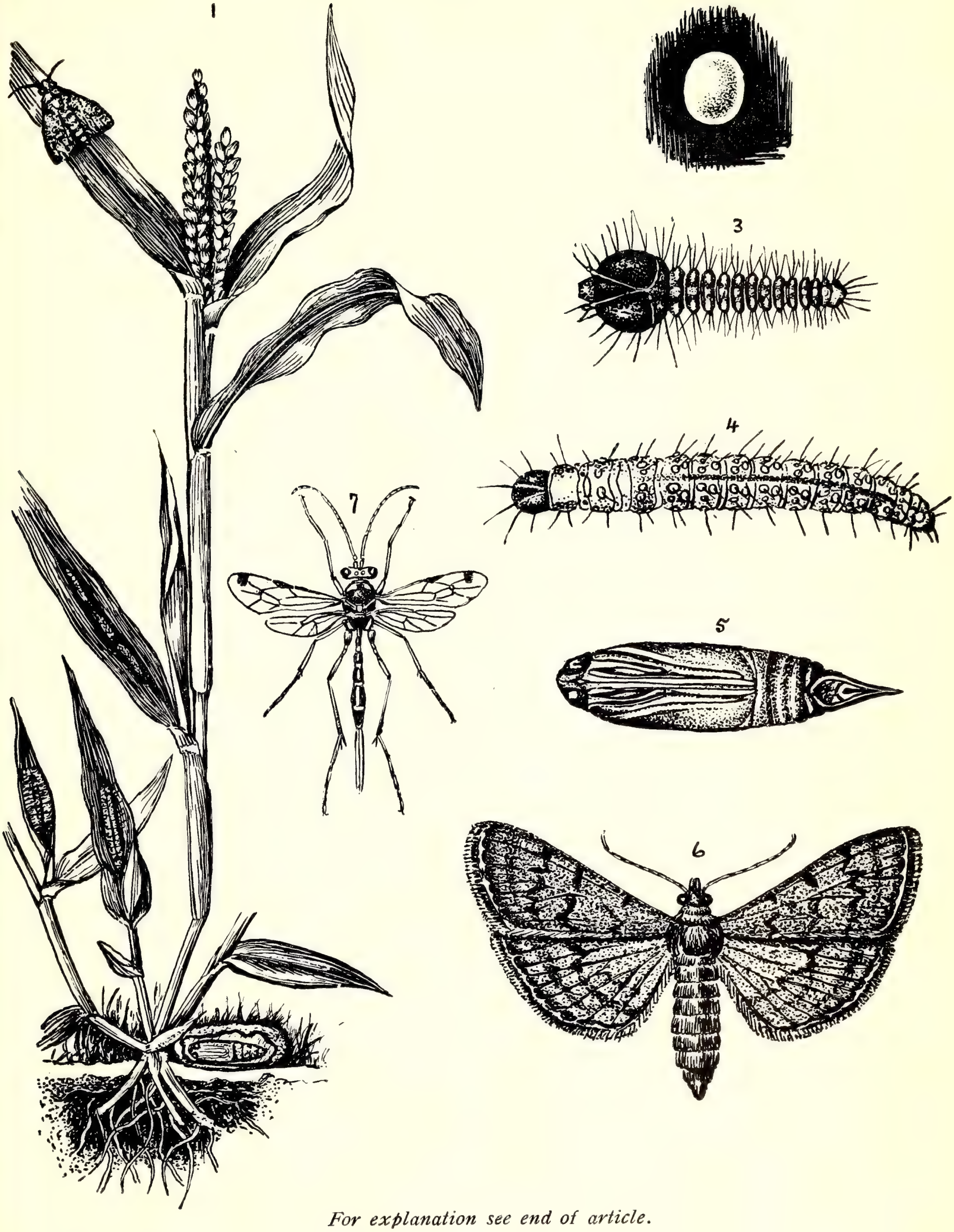
METHODS OF CONTROL

As the parasite noted is not found in large numbers control by this means is out of the question. The only method of dealing with the pest would appear to be the collection and destruction of adults. Since large numbers of moths were found attracted to electric light at the Agricultural College and Research Institute the possibility of controlling them by means of light traps was tested and the results proved to be fairly satisfactory. The use of hand net was also found efficient in minimising their numbers.

Reference to Plate—

1. *Panicum javanicum* plant showing the various stages of the pest.
2. Egg x 43.
3. Just hatched larva x 31.
4. Mature larva x 3.
5. Pupa x 5.
6. Adult x 3.
7. Larval parasite x 2.

M. C. CHERIAN, B.A., B.S.C., D.I.C.
AND C. J. GEORGE, M.A.



For explanation see end of article.

PROCEEDINGS

Proceedings of the meeting held on June 24, 1926

A meeting of the members of the Bombay Natural History Society and their friends took place on Thursday, at 6.15 p.m., in the Board Room at the Prince of Wales' Museum, Rev. E. Blatter, S.J., Vice-President, presiding.

New Members

The following fifty-seven new members were elected since the last meeting:—Mr. G. Cunnigham, C.I.E., O.B.E., I.C.S., Kabul; Mr. A. Boller, Bombay; Major W. Brooke-Purdon, D.S.O., M.C., O.B.E., R.A.M.C., Wellington, Nilgiris; Mr. J. E. Clutterbuck, R.E., Bhurkunda; The President, Mess Committee, 4th Bn. 10th Baluch Regt. (D.C O.), Quetta; The Director, Institute of Plant Industry, Indore, C.I.; Miss R. Navalkar, Poona; The Mess President, 4/4th Bombay Grenadiers, Razani, N.W.F.P.; Mr. Fred Hagenbach, Bombay; Mr. H. A. Hyde, M.C., Indore, C.I.; The Curator, Sarawak Museum, Kuching, Sarawak; Mr. K. H. McIntosh, Mussoorie; The President, Mess Committee, 4/12th F.F. Regt. (Sikhs), Ambala Cantt.; Mr. G. H. Farquharson, Misa, Assam; Mr. J. A. G. Campbell, Bokakhat, Assam; Mr. K. R. Eates, Karachi; Mr. J. D. Finlay, Clarkabad, Lahore Dist.; H. H. the Thakor Saheb Lagdhirsinhji of Morvi, Morvi; H. H. The Thakor Saheb Bahadursinhji of Palitana, Palitana; Lt.-Col. Gordon Casserly, Europe; Mr. F. G. Burgess, Maymyo, Burma; Mr. T. G. Cule, Lumding, Assam; Mr. I. C. Dare, Bombay; The Mess President, Officers' Mess, 3/4th Bombay Grenadiers, Lucknow; Mr. D. G. Cameron, Mahendragiri, Nagercoil, S. I.; Mr. D. G. Sevastopulo, F.E.S., Lyallpore; Mr. Ali Asghar H. Fyzee, Bombay; The Mess Secretary, 3/17th Dogra Regt., Alipore; Col. St. G. L. Steele, C.B., Abbottabad, N.W.F.P.; Mr. A. Macleod, I.C.S., Peshawar; The Mess President, 3/10th Baluch Regt., Lahore Cantt.; The Mess President, Officers' Mess, Royal Engineers, Roorkee, U.P.; Mr. C. H. Thompson, I.F.S., Rangoon; Mr. W. G. Crawford, I.F.S., Rangoon; H. E. Lord Irwin, P.C., G.M.S.I., G.M.I.E., Viceroy of India, Simla; Capt. Malik Anun Singh, M.B., I.M.S., Taiping, F.M.S.; Capt. L. D. W. Hearsey, M.C.V.D., *via* Mailani, Kheri, U.P.; Mr. A. F. Gibbs, Umaria, B.N.Ry.; Mr. G. Atkinson, Dehra Dun; Mr. V. A. N. Sausman, Dango, *via* Billimora; Mr. J. E. Bisset, Meppadi, P.O.S.I.; Mr. E. H. Peacock, B.F.S., Mawlaik, Burma; Mr. F. D. S. Richardson, England; Mr. F. Gersperger, Bombay; Mr. F. I. Morgan, Kadur; Mr. K. Johnson, Nazira, Assam; Mr. L. G. Knight, Kalthurity, S.I.; Mr. C. W. Clode, Coorg; The Agricultural Engineer, Burma, Mandalay; the Mess Secretary, 1/4th Bombay Grenadiers, Bombay; the President, Mess Committee, 3/15th Punjab Regt., Allahabad, U.P.; H. H. Durjansal Singh, Ruler of Khilchipur; Mr. Duncan T. Merson, Nilgiris; Capt. V. R. Wilton, I.A.S.C., Dalhousie, Punjab; Mr. R. L. Gamlen, Hyderabad, Deccan; Capt. A. R. Spurgin, Bombay; Mr. C. C. Fowler, M.I.E.E., Bombay.

The Honorary Secretary announced that not only had H. E. Lord Irwin become a member of the Society in his private capacity but he had also, as Viceroy of India, been pleased to become a Patron of the Society and the Society therefore now had the honour of having as their Patrons both His Majesty the King-Emperor's representative in India and His Royal Highness the Prince of Wales, the Heir Apparent to the Throne.

This might be considered another tribute to the work of the Society. Work which was appreciated by those who bore rule in India, for not only was His Excellency the Governor of Bombay a member and President of the Society, but the Governors of Bengal, Madras, Burma, and the United Provinces were also members.

GENEROUS DONATIONS

A hearty vote of thanks was passed to the Trustees of the Sir Sassoon David Trust Fund for a donation of Rs. 6,000 and to the Trustees of the Wadia Charities for a donation of Rs. 750. These donations would enable the Society, in conjunction with the Director of Public Instruction, to carry out the scheme for teaching nature study in schools in this Presidency referred to by H. E. Sir Leslie Wilson at the annual meeting of the Society. Mr. Salim Ali, who had recently been appointed Assistant Curator to the Society, would be appointed the guide, philosopher and friend of those teachers in schools who took the nature study course about to be inaugurated at the Museum.

THE LATE MR. E. COMBER

The Honorary Secretary referred to the great loss sustained by the Society through the recent death of his old friend and colleague Mr. E. Comber. Mr. Comber became a member of the Society in 1894, joining the Committee in 1901. He was keenly interested in Birds and also in Hymenoptera. He contributed several papers to the Society's Journal. By the last mail it was learnt that Mr. Comber's daughter had presented the Society with her father's valuable collection of Hymenoptera.

NEW EXHIBITS AT THE MUSEUM

Sir Reginald Spence drew the attention of the members and those present to the beautiful exhibits which had been added to the various galleries since the last meeting.

The first of these was the magnificent group illustrating the nesting of the Great Indian Hornbill. The material for this case was obtained through the energies of Mr. M. S. Tuggerse, Divisional Forest Officer, Honavar. The tree in which the nest was situated was 150 ft. high. The nest itself was 75 feet from the ground—photographs in the case show the position of the nest quite clearly. The tree was felled and the section containing the nest had to be transported a considerable distance to the coast and then shipped to Bombay. The female and young (which was a little over two weeks old) were despatched to Bombay alive. The two occupy the nest, while 'Old Bill' who lived in the Society's room for twenty-six years has taken on the responsibilities of a father—here he is seen feeding the family through the small opening which is left after the entrance hole has been sealed up. These birds inhabit the evergreen forests of the lower Himalayas, Kanara, and Burma.

Besides this, there was a fine specimen of a Panther which was secured for the Society by Col. R. W. Burton, I.A. (Retd.) and also a Scaly Ant-eater or Pangolin which was obtained by Mr. F. Ludlow from Baluchstian. Several other smaller exhibits were also on view in different galleries all of which had been set up in the Society's laboratory.

Rev. E. Blatter, S.J., then read a paper on the 'Luminescence of Animals and Plants,' a full account of which will appear in the next number of the journal.

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